Report no. 95/FF/52

January 1996

Indo-US coal preparation programme support

Final report

Submitted to the
Burns and Roe Enterprises, Inc.
United States of America

Energy-Environment Interface
Tata Energy Research Institute

Preface

Background

Coal is the primary source of energy in India and the power sector is the major consumer of coal. During the last two decades, though the power generation from coal based power stations has increased enormously, the performance of the power plants has been affected by various problems including coal supplies and coal quality. The variation in the quality of coal supplied to the power plants from different sources has seriously affected the operation of the power plants. These problems are bound to increase in the future because of the increasing trend in production of inferior grades of coal through large mechanized opencast mining. The quality problems in supply of coal from the major coalfields like Talcher, North Karanpura, Korba, Singrauli, etc. can be tackled only by resorting to beneficiation of coal.

The present study has been undertaken mainly to assess the potential for investments in coal washing in India by the private sector including foreign companies. The report also covers in detail some of the related issues like coal transportation, coal trading, coal pricing, demand assessment for washed coal and recent developments in coal washing in India. The study is sponsored by M/s Burns & Roe Enterprises, Pittsburgh, USA and has been carried out by the Tata Energy Research Institute in consultation with concerned officials from the Ministry of Coal, Central Mine Planning and Design Institute, Ministry of Railways, and the sponsoring organization. Various documents and reports on coal industry prepared by different organizations were studied and relevant information was taken from these reports.

Objectives

The scope of the study is as follows:

1. A profile of the transportation sector for moving coal. This shall include a review of the existing and expected transportation network for coal movement with consideration of, but not limited to, such issues as: capacity problems, loadout, wagon availability, potential use of unit trains, guarantees, load shifting and all else that could and would affect coal washing operation.
2. Existing coal trading market in India. This would include issues such as the volume of free traded coal, pricing mechanism, buyer/ seller contractual relationships, legal and regulatory constraints on coal trading and coal transport.
3. Status of investment environment in the industry and recent market developments.
4. To identify 10-15 potentially profitable investment opportunities.

Project Team

Mr P V Sridharan	Senior Fellow
Mr S K Chand	Consultant

Acknowledgments

We gratefully acknowledge

- The financial support provided by Burns and Roe Company for executing the study.
- Dr S N Rao and Dr Carl Bell for guidance in the preparation of the report.
- Officials in the Ministry of Coal, Railway Board, Coal India Ltd, RITES and Planning Commission for assistance and valuable suggestions.
- The guidance and suggestions received from the Director and colleagues in TERI.
- Ms Alka Nagpal for her excellent secretarial support.

Contents

List of tables
List of figures
List of annexures
List of abbreviations

Executive summary

Chapter 1 Coal industry - current performance and future projections

Introduction	1
Coal reserves	1
Coal production	1
Coal consumption pattern	4
Coal movement	4
Coal demand - future projections	5
Coal production plans	8

Chapter 2 Profile of the transportation sector

Rail network	10
Coal despatch by different modes	12
Future projections of coal movement (based on RITES report, 1988)	18
Future projections for coal movement (based on MOC, 1994)	21
Inter-modal split for future coal movement	22
Evacuation of coal from selected coalfields	22
Infrastructural needs for handling large coal traffic	24
Rail tariff for freight movement	25
Own your wagon scheme of Indian Railways	26

Chapter 3 Coal trading market in India

Colliery control order	32
Distribution of coal	32
Agreement for supply of coal to consumers	39

Chapter 4 Coal pricing

Current procedure for coal pricing 57
Trend in coal prices 58
Coal price and demand 60
Market price 60
Imported coal 66
Delivered price of indigenous coal at Madras port 67

Chapter 5 Investment environment & recent market developments in coal washing

Characteristics of Indian coal 83
Need for washing non-coking coal 83
Recent developments in coal washing 84
Demand for washed coal 85
Price of washed coal 93
Comparison of delivered price of RC and WC at a 500-MW TPS 94
Conclusions 97

Reference

List of tables

1.1 Technology-wise coal production (Mt) 2
1.2 Type-wise coal production (Mt) 2
1.3 Coalfield-wise coal production (Mt) 3
1.4 Sector-wise coal consumption pattern (Mt) 4
1.5 Mode-wise coal movement (Mt) 5
1.6 Sector-wise coal demand (Mt) 6
1.7 Distance-wise coal-demand for electricity sector (utilities only) - Mt 7
1.8 Projected mode-wise movement of coal for electricity sector (utilities only) -Mt 8
1.9 Coalfield-wise production projection (Mt) 9
2.1 Movement of bulk commodities and freight earnings - IR 10
2.2 Traction profile of freight traffic on IR 11
2.3 Mode-wise coal despatches (Mt) 12
2.4 Existing status of MGR/own wagon system for coal movement 14
2.5 Existing status of belt/ropeway systems for coal movement 15
2.6 Major ports: capacity and traffic handled in 1993-94 (Mt) 16
2.7 Critical routes and projected coal traffic (Mt) 20
2.8 Coal demand for power and other consumers (figures in Mt) 21
3.1 Coal consumption and demand in non-core sector (Mt) 36
4.1 Administered price of non-coking coal at pit-head 59
4.2 Revised rates of royalty on coal (Rs. per tonne) 63
4.3 Delivered price of grade F coal for selected distances (Rs./tonne) 64
4.4 Landed cost of coal at Madras port (Rs. per tonne) 67
5.1 Status of non-coking coal washing 84
5.2 Distance-wise coal-demand for electricity sector (utilities) - Mt 85
5.3 Coalfield-wise coal demand for TPS located beyond 500 km (existing + new) 86
5.4 Coal demand for TPS in 2001-02 (Mt) - as per MOC 87
5.5 New coal mines likely to be linked to coal washeries 88
5.6 Coal mining blocks linked to captive power plants 89
5.7 Washed coal for cement plant cluster 91
5.8 Price of washed coal at pit-head (Rs./t) 94
5.9 a. Deliverd price of raw coal and washed coal (process cost at Rs.150/t) 95
5.9 b. Deliverd price of raw coal and washed coal (process cost at Rs.100/t) 95

List of figures

2.1 Growth of rail traffic (all commodities) 13
2.2 Inter modal splits for coal movement 13
2.3 Schematic route diagram showing coal density flows, 1994-95/2001-02, MTPA 19
4.1 Average price of coal at pit-head (Rs/t) 58
4.2 Trend in coking coal demand and price (steel industry) 61
4.3 Trend in non-coking coal demand and price (power sector) 61
4.4 Coal price at consumer end 62
4.5 Rail tariff for coal movement, April 1995 65
4.6 Average freight rate per tkm (all commodities) 65
5.1 a. Delivered price of RC & WC at 500 MW TPS (process cost = Rs.150/t) 96
5.1 b. Delivered price of RC & WC at 500 MW TPS (process cost = Rs.100/t) 96

List of annexures

2.1 Own your wagon scheme of Indian Railways 27
3.1 Extracts from Colliery Control Order, 1945 41
3.2 Agreement for supply of coal to MPEB power stations between WCL and MPEB 45
4.1 Revised administered price of coal, June 16, 1994 69
5.1 Data as revealed by Boreholes 97
5 2 Section 3 in Sub-section (3) in Clause (a) of the Amended Coal Mines (Nationalization) Act 1993 99
5.3 Mining blocks identified for being offered for captive mining by power sector 100
5.4 Power plant-wise coal demand (As per MOC) 102
5.5 a. List of power plants (existing and new) located beyond 500 km (Scenario I) 106
5.5 b. List of power plants (new) located beyond 500 km (Scenario II) 110
5.6 List of sponge iron plants linked to selected coalfields 111
5 7 Captive power plants 111
5.8. List of items included in the calculation of coal preparation cost 114

List of abbreviations

A	Ash percentage
ACC	Associated Cement Companies
APHP	Average Pit-Head Price
BALCO	Bharat Aluminium Company
BCCL	Bharat Coking Coal Ltd.
BICP	Bureau of Industrial Costs and Prices
CCL	Central Coalfields Ltd.
CEA	Central Electricity Authority
CF	Coalfield
CIC	Central India Coalfields
CIF	Cost Insurance and Freight
CIL	Coal India Limited
CMPDIL	Central Mine Planning and Design Institute Limited
CV	Calorific value
ECL	Eastern Coalfields Ltd.
ER	Eastern Railways
FBC	Fluidized Bed Combustion
FCI	Fertilizer Corporation of India
FMCI	Fuel Management Corporation of India
FOB	Freight on Board
FOR	Freight on Rail
GCV	Gross Calorific Value
IISCO	Indian Iron and Steel Company
IR	Indian Railway
IRS	Indian Railways Service
kCal/kg	kilo Calorie per kilogram
km	kilometers
kWh	Kilo Watt hours
LC	Letter of credit
LSS	Liberalized sales scheme
M	Moisture percentage
MCL	Mahanadi Coalfields Ltd
MGR	Merry Go Round

MOC	Ministry of Coal
Mt	Million tonnes
Mt/a	Million tonnes per annum
Mtpa	Million tonnes per annum
MW	Mega Watt
NALCO	National Aluminium Company
NCL	Northern Coalfields Ltd.
NEC	North Eastern Coalfields
NTPC	National Thermal Power Corporation
OCP	Open Cast Project
POL	Petroleum, Oil and Lubricants
RDSO	Research, Design and Standards Organisation
RITES	Rail India Technical and Economic Services
ROM	Run Of Mine
SCCL	Singareni Coal Company Ltd.
SEB	State Electricity Board
SECL	South Eastern Coalfields Ltd.
SG	Steel Grade
SLC	Standing Linkage Committee
STPS	Super Thermal Power Station
TERI	Tata Energy Research Institute
tkm	tonne kilometre
TPS	Thermal power station
UHV	Useful Heat Value
WCL	Western Coalfields Ltd.
WG	Washery Grade

Executive summary

Coal production, consumption and demand

One of the considerations for the nationalization of coal mines was to ensure that the production of coal which is the primary source of energy should be properly planned to meet the increasing requirements in the industrial development of the country. It was expected that nationalization of the coal industry would also ensure fair and equitable distribution of coal to meet the essential needs of users, both in the core and non-core sectors.

Coal production has registered an annual growth rate of about 5.5% during the last 2 decades, steadily increasing from a level of 77 Mt in 1972-73 to about 254 Mt in 1994-95. In the post-nationalization period, major thrust was given towards development of new outlying coalfields like Rajmahal, North Karanpura, Singrauli, Korba, Ib valley and Talcher. These coalfields contributed 43% of the total coal production in 1994-95. The opencast mines which contributed only about 28% of the total production at the time of nationalization (1973) increased their share to about 70% in 1994-95. The share of inferior grade non-coking coal production (E, F, G grades) has increased from 20% to 50% of the total non-coking coal production during the last 15 years. Bulk of the inferior grade non-coking coal production comes from Rajmahal, North Karanpura, Singrauli, Wardha, Korba, Ib valley and Talcher coalfields.

The coal consumption has increased from about 71 Mt in 1970-71 to 253 Mt in 1993-94. Electricity sector is the single largest consumer of coal followed by iron and steel and cement sectors. According to Ministry of Coal's projections, the coal demand is expected to grow at an annual average of 6.3% during the 8th Plan and 5.6% during the 9th Plan and would be 394 Mt in 2001-02. The demand of coal for the power stations would increase from about 172 Mt in 1993-94 to 295 Mt in 2001-02 showing an annual average growth rate of 7%. The share of consumption of coal in the power stations located at pit-head and within 200 km from the source was about 54% in 1994-95 and is projected at about 52% in 2001-02. The share of coal consumption in TPS located beyond 1000 km increases from 29% in 1994-95 to 34% in 2001-02 (an increase of 42 Mt).

The coal production is expected to grow at an annual average rate of 5% during the 8th Plan and at 3.6% during the 9th Plan and would be 349 Mt in 2001-02. Almost 50% of the total production in 2001-02 would be contributed by Rajmahal, North Karanpura, Singrauli, Korba, Ib valley and Talcher coalfield. In addition, about 25 Mt capacity for coal production is being established by private power companies as captive mines.

Coal transportation

Indian Railway (IR) is the principal mode of transport in the country. Of the total tonnage of 359 Mt of revenue earning freight carried by the IR in 1993-94, the coal's share was 167 Mt, which was about 47% of the total. The freight earnings from coal movement was 42% of the total freight earnings of the Railways. Therefore, coal is the first charge on the IR in respect of freight business. Coal despatches from pit-heads are through various modes. Rail and road modes constitute the most important means of coal despatches from the pit-head. In recent years the MGR system of coal movement has made rapid strides. While coal production during the 10 year period (1984-85 to 1994-95) increased by an annual average rate of 5.6%, tonnage lifted by rail increased by only 3.8%. The share of rail in the total coal movement has declined from 70% in 1984-85 to 57% in 1994-95. This reduction is mainly due to the pit-head power stations taking coal by MGR, which has increased from 6 to 19% during the same period. The quantity of coal moved by road has been increasing at an annual average rate of 5.8% during the last decade and has maintained its share at 19% in the total coal movement. The coastal movement has been increasing consistently over the years with increasing demand from coastal power stations.

One of the first studies to assess the adequacy of line capacity, and other infrastructure requirement for transportation of increased volume of coal traffic was carried out by RITES in 1988. This report identified the likely routes on which capacity constrains may get exposed. The actual coal flows in 1984-85 was taken as the baseline data and anticipated coal flows in 1989-90 were worked out based on projected demand from consuming centres. According to this study the critical sections/routes were as follows: Gomoh-Gaya, Sonnagar-Mughalsarai, Allahabad-Kanpur-Aligarh-Gaziabad, Bhusaval-Jhalagaon, Udna-Vadodara, Wardha-Bhusawal. Raj Kharaswan-Rourkela, and Champa-Bilaspur. The study also suggested remedial measures to overcome the line constraints in these sectors.

The present projections of coal demand by the MOC shows that the coal demand increases rapidly in North Karanpura, Singrauli. Korba, Ib valley and Talcher coalfields. This would result in the following.

- The northern stream will see very heavy movement of coal on the Grand Chord of Eastern Railway and 'A' route of Northern Railway due to massive growth of coal production in North Karanpura and its linkage to Northern power houses,
- Jharsuguda-Nagpur-Bhusawal and Champa-Bilaspur-Katni-Bina route on the Souther Eastern and Central Railways and Talcher-Cuttack-Pradip lines on the East Coast will get heavily loaded by the quantum jump in Ib valley and Talcher, Korba and Singrauli coalfields.

The results are similar to the RITES study findings. The IR has already plemented many of the recommendations on line capacity while others are in the process of being implemented. During discussions with the Railways, it emerged that the augmentation of the line capacity is being implemented as per plan and there will be no constraint for the movement of the proposed quantity of coal by the year 2001-02.

Since power plants are the largest consumer of coal, the coal movement plans would depend mainly on the location of future power plants. The pit-head power plants would draw coal through captive modes like MGR/own wagons, but the distant power plants would have to depend on rail and rail-cum-sea modes for coal movement. It is also assumed that road movement would not increase in the future from the levels of 1993-94, since they are costly, except for short lead destinations. Rail however, would continue to remain as the most important mode and its share increases from 57% in 1993-94 to 64% in 2001-02.

Coal distribution

Coal is an essential commodity under the Essential Commodities Act. Its acquisition, transport and transfer is inter-alia controlled by the Colliery Control Order, 1945 which order has been continued under the Essential Commodities Act. Most of these controls had been withdrawn in 1967, but were again enforced on coal produced from the mines of Coal India through a government notification dated June 4, 1992. However in the notification of June 1992, the coal sold from Coal India mines under the liberalized sale scheme without actual user condition has been exempted from the provision of the colliery control order. Due to paucity of rail transport as also limited availability of higher grades of coal, administrative control on the allotment and movement of coal has been continued in as much as priority is being given to the actual users of coal. Distribution was inevitably regulated by the railways within their overall operational capacity.

Core sector

There is a demand-linkage system for the core sector (power, steel, and cement) and non-core sector consumers (all other industries). A standing Linkage Committee was first constituted by the Government in 1973 to arrange and coordinate the supplies of coal to thermal power stations. Subsequently coal supplies to cement industry was also entrusted to this committee. Another standing linkage committee was constituted in 1977 for linking coal supplies to steel plants. The distribution of coking coal to steel plants is controlled by coal controller who holds monthly allocation meetings with the coal companies, steel plants and railways.

Non-core sector

The non-core sector consists of a host of industries like brick, textiles, paper, chemicals, glass, ceramics, refractories, jute, tea, etc. All consumers in the non-core sector having a projected requirement of upto 5,000 tonnes of coal per month are required to obtain a linkage from Coal India in respect of grade, size and source. The linkage is issued by the Non-core sector Linkage Committee constituted by Coal India. The consumers having requirements of more than 5,000 tonnes per month are required to obtain clearance from Ministry of Coal for linkage. After receiving clearance from the Ministry, the Coal India issues linkage.

The coal consumption in the non-core industries has marginally increased from 27.3 Mt in 1989-90 to 27.8 Mt in 1993-94 as against a demand of 34 Mt in 1994-95 projected by the Working Group for the 8th Plan. The coal consumption is much lower than the projected demand. The coal consumption in textiles, glass, ceramics and refractories is showing a clear declining trend. The consumption of the other industries is more or less stagnant or declining. The coal demand from brick units is assumed to increase due to increase in demand for bricks. The projections for 2001-02 is estimated at 27.6 Mt. Therefore, it can be concluded that, even though there would be growth in the non-core industries, the coal demand is stagnant. Many of these industries are gradually shifting to other fuels and also reducing their overall energy consumption through improvements in energy efficiency.

Coal pricing and delivered price of coal

The pit-head price of coal is presently administered by the Central Government and is based on the average cost of production for the industry, differentiated between grades of coal depending upon properties such as ash content or useful heat value (UHV). The pricing procedure focuses only on the pit-head or the mine head price with the delivered price of coal left largely uncontrolled. The delivered price of coal to the consumer is determined by adding transportation costs, taxes, royalty, cess, duties and taxes and transportation and handling costs from the colliery to the consumer. Due to geographical concentration of coalfields in the eastern part of India, coal is transported over long distances. Hence, the share of transportation costs in the delivered price is quite high. During the pre-nationalization period when coal prices remained fairly low and increases in them were steady. The prices increased at a growth rate of 3.5% during the 1950s and 5.6% during the 1960s. The post-nationalization period which witnessed a sharp rise in prices, registering an annual rate of increase of 12.8% during 1970-80 and 9 7% during 1980-95. The administered price of coal was last revised on June 16, 1994.

The rail tariff per tonne km for coal movement in train roads gradually decreases from Re 0.74/- per tkm for a haul of 100 km, to Re. 0.54/- per tkm for a haul of 1300 km and to Re 0.49/- for 2000 km The delivered price of grade F coal for selected distances has been estimated and increase from Rs. 454/- at 200 km to Rs. 1311/- at 2000 km The share of transportation charge in the delivered price of coal increases from 27% for a 200 km haul to 68% for a 1300 km haul and becomes 75% for a 2000 km haul.

Coal imports

Since the existing coking coal washeries are unable to meet the demand of the steel sector in terms of quality and quantity, 7-8 Mt of low ash coking coal is being imported annually and this would increase in the future. Import of non-coking coal may become competitive to location specific industries on account of reduction in customs duty from 85% to 35%. The industries that are likely to import good quality non-coking coal are cement, heavy chemical (caustic soda) and sponge iron units. It is estimated that about 0.5 Mt of non-coking coal was imported during 1994-95.

As per information available the FOB price of steam coal in 1995 at Australian port is US $ 40.3/t and at South African port is US $ 32.9/t. The 1994 prices were US $ 34.35/t (Australia) and US $ 24.5/t (South Africa). The average CIF price at Madras port is taken as US $ 50/t. The imported coal would have an average gross calorific value of 6,500 kCal/kg. The landed cost of imported coal per tonne at Madras port would be Rs. 2,452/- per ton.

Comparison of indigenous and imported coal prices

It is assumed that the indigenous coal from Talcher and Ib valley coalfields would be 'F' grade coal with a gross calorific value of 3,600 kCal/kg. Therefore, for every tonne of imported coal, 1.8 tonne of indigenous coal would be required for consumption. Taking this factor of 1.8 the delivered price of indigenous coal at Madras port would be Rs 1,793/- for Talcher coal and Rs. 1948/- for Ib valley coal. Therefore, it can be concluded that with the present price of imported steam coal the indigenous coal is cheaper.

Demand for washed coal

The majority of non-coking coal reserves in India are in thick seams and inferior in quality. Most of the seams are banded in nature. The coaly matter in these seams is of high ash and the quality becomes worse because of these bands. Increased mechanized mining, particularly opencast mining, has led to further deterioration in the quality of run-of-mine (ROM) coal. This extraneous material can be almost totally removed by washing but not without additional costs. The potential coalfields for increased supplies of inferior grade coals linked to TPS in future are Korba, Talcher, Ib valley, North Karanpura, Singrauli and Wardha. All these coalfields have thick banded seams of inferior coal.

The Coal Mines Nationalization Act has been amended in 1993 permitting setting up of washery for coal washing by the private sector. Even though there are limitations that the coal washing company cannot sell washed coal directly to the consumers (under the Colliery Control Order), it is a step in the right direction. This has already attracted private sector companies and a washing capacity of about 33 Mt has been contracted till now for installation in different coalfields.

The demand for coal washing capacity has been estimated for utilities and other potential consumers. It ranges from 77.1 Mt to 106.3 Mt in 2001-02, of which the demand for cement and sponge iron sector (with ash between < 25% to 27%) is estimated at 19.6 Mt. The balance is for power stations (utilities + private sector) with washed coal having 32 ± 2% ash. The demand for washed coal for the power plants has been estimated for the following 2 scenarios. The demand is 57.5 Mt for Scenario I and 75.7 Mt for Scenario 2.

Scenario 1	All power stations (existing and proposed) located beyond 500 km from the coal source.
Scenario 2	Only new power plants located beyond 500 km from the coal source.

The potential coalfields for setting up the washeries are Talcher, North Karanpura, Ib valley, Singrauli and Wardha. New coal mines with an estimated capacity of about 67 Mt in these coalfield have also been identified, which can be linked to washeries.

Comparison of delivered price of raw coal and washed coal

A comparison between the delivered price of raw coal and washed coal for a 500 MW TPS was done for distances ranging from 200 to 2000 km. The washed coal price was calculated based on 80% yield and 70% yield, with an estimated process cost of Rs. 100/- and Rs. 150/- per tonne and zero value for the rejects. The results show that there are savings in fuel charges for TPS located beyond 1000 km in consuming washed coal. These are as follows:

- For washed coal at 80% yield and estimated process cost of Rs. 100/- per tonne.
    - The cut-off point is at a distance of about 1100 km from the source.
    - Savings on fuel charges (cost of coal + freight charges) is about Rs. 101 million and Rs. 169/- million at a distance of 1600 and 2000 km respectively.
- For washed coal at 70% yield and estimated process cost of Rs. 100/- per tonne.
    - The cut-off point shifts to 1800 km from the source and the savings on fuel charges is marginal at 2000 km.
- This is in addition to other benefits, which may accrue to the TPS by way of increased generation, improvement in efficiency, etc.
- For washed coal with a estimated process cost of Rs. 150/- per tonne, the cut-off point shifts beyond 1700 km (with yield at 80%) and the savings in fuel charges is marginal. With yield at 70%, there is no savings upto 2000 km.

Comparison of delivered price of washed coal and imported coal at Madras port

The delivered price of washed coal from Talcher at Madras port will be a minimum of Rs. 1,258/- and a maximum of Rs. 1,421/- per tonne depending on the process cost and yield percentage. Assuming that the washed coal would have a gross calorific value of 4,600 kCal/kg and imported coal 6,500 kCal/kg, 1 tonne of imported coal would replace approximately 1.4 tonnes of washed coal. The cost of this washed coal at Madras port would be between Rs. 1,761/- and Rs. 1,989/- as against the cost of imported coal which is Rs. 2,452/-. Therefore, the washed coal price at Madras port would be cheaper than the imported coal.

It is clear from this study that demand for non-coking washed coal exists for distant power houses and it is remunerative to set up washing facilities in selected coalfields.

CHAPTER 1

Coal industry - Current performance and future projections

Introduction

Coal industry was nationalized in two stages viz. coking coal mines were taken over in October 1971 and all other coal mines in January 1973. This was done, apart from other considerations, with a view to ensure that the production of coal which is the primary source of energy should be properly planned to meet the increasing requirements in the industrial development of the country. It was expected that nationalization of the coal industry would also ensure fair and equitable distribution of coal to meet the essential needs of users, both in the core and non-core sectors.

Coal reserves

Coal is the primary source of energy in India meeting over 58% of the country's commercial energy requirements. This is in tune with our resource endowments where coal reserves are much larger as compared to oil and natural gas reserves. The total coal reserves (as on 1.1.95) have been assessed at 200 billion tonnes of which 68 billion tonnes are proved reserves.

The salient features of coal reserves are as follows.

- About 63% of the total coal reserves occur within 300 m depth and 26% occurs in the depth range from 300-600 m depth. Only about 10% reserves occur beyond 600 m depth in deep coal basins like Jharia and Raniganj coalfields.
- Coking coal reserves are only 15% of the total coal reserves.
- Reserves of non-coking coals amount to about 85% of the total reserves of which only 12% are of superior grade.
- Therefore, it can be concluded that bulk of the coal reserves (73%) are inferior grade non-coking coals occurring in thick inter-banded seams and located in coalfields like Singrauli, Talcher, North Karanpura, Rajmahal, Ib valley and Korba, etc.

Coal production

To ensure sustained and planned development of all facets of the coal industry, massive investment to the tune of about Rs. 18,000 crores has been made since nationalization in opening up of new mines, re-organization of existing mines and development of associated infrastructure. Coal production has registered an annual growth rate of about 5.5% during the last 2 decades, steadily increasing from a level of 77 Mt in 1972-73 to about 254 Mt in 1994-95. In the post-nationalization period, major thrust was given towards development of new outlying coalfields like Rajmahal, North Karanpura, Singrauli, Korba, Ib valley and Talcher. These coalfields contributed 43% of the total coal production in 1994-95. Consequent upon development of new coalfields in outlying areas, a large number of pit-head super thermal power stations have come up in different parts of the country. This has helped in reducing the load on railways as most of these pit-head power stations transport their coal by captive modes such as merry-go-round (MGR) system.

The opencast mines which contributed only about 28% of the total production at the time of nationalization (1973) increased their share to about 70% in 1994-95. The Government adopted a deliberate policy to increase production through opencast mines to meet the increasing demand of coal for the utilities. The major factors in favour of opencast mines are shorter gestation period, high recovery and safety, and lower cost of production. However bulk of coal produced from opencast mines is inferior grade coal. As a result of this policy, the production of inferior grades of both coking and non-coking coal have been increasing in the last two decades and this trend is continuing. The details of technology-wise and type-wise production are given in Tables 1.1 and 1.2.

Table 1.1. Technology-wise coal production (Mt)

Year	Underground	Opencast	Total
1970-71	58.2 (79.9)	14.7 (20.1)	72.9
1980-81	73.3 (64.2)	40.7 (35.7)	114.0
1994-95 (Est)	76.1 (30.0)	177.7 (70.0)	253.8

Table 1.2. Type-wise coal production (Mt)

Year	Coking	Non-coking	Total
1970-71	17.8 (24.4)	55.1 (75.6)	72.9
1980-81	26.8 (23.6)	87.2 (76.4)	114.0
1994-95 (Est)	45.7 (18.0)	208.1 (82.0)	253.8

Note: Figures in parenthesis indicate percent share.

The production of superior quality non-coking coal (Grades A, B C & D) in 1980-81 was about 80% which has declined in 1994-95 to about 50%. The balance 50% was inferior grade non-coking coal (Grade E, F & G). The share of F & G grades in inferior non-coking coal is over 70% and this will increase further in the future.

Coalfields like Jharia, West Bokaro, East Bokaro and Ramgarh produce largely coking coals. Raniganj, South Karanpura, Patherkhera, Pench Kanhan, Korba, Central India and North East Coalfields produce all the superior quality non-coking coal. Bulk of the inferior grade non-coking coal production comes from Rajmahal, North Karanpura, Singrauli, Wardha, Korba, Ib valley, Talcher and Singareni coalfields. Out of these Wardha, Rajmahal, Singrauli and Singareni are almost fully committed to pit-head power stations. The coal demand of distant power houses are largely met from North Karanpura, Ib valley, Talcher and Korba coalfields. The coalfield-wise production in given in Table 1.3.

Table 1.3. Coalfield-wise coal production (Mt)

Coalfield	1984-85	1994-95
Raniganj	17.5	14.71
Mugma Salanpur	5.1	4.12
Rajmahal	0.6	6.02
Jharia	21.8	28.75
Giridih	0.7	0.36
West Bokaro	3.5	3.04
East Bokaro	8.9	9.50
Ramgarh	1.3	2.25
South Karanpura	5.8	4.75
North Karanpura	4.7	11.41
Singrauli	10.7	32.50
Wardha Valley	7.2	15.98
Umrer	3.1	5.02
Patherkhera	2.5	2.10
Pench-Kanhan	3.8	4.14
Central India	16.4	19.01
Korba	11.0	30.99
Ib valley	2.0	9.39
Talcher	3.4	17.93
North-East	0.8	1.19
Singareni	12.3	25.60
Others	4.3	5.04
Total	**147.4**	**253.80**

Note: Others include mines operated by TISCO, IISCO, DVC in Jharia, East Bokaro and West Bokaro Coalfields.

Coal consumption pattern

The coal consumption has increased from about 71 Mt in 1970-71 to 253 Mt in 1993-94. Electricity sector is the single largest consumer of coal followed by iron and steel and cement sectors. The indigenous coal production is by and large meeting the country's demand except for the steel sector. The demand of washed coking coal for the steel plants in recent years is far outstripping the indigenous supply both in terms of quality and quantity. The existing washeries are old and are unable to meet the demand in terms of quality of supplies (< 17.5% ash content in coal). Therefore, 6-7 Mt of low ash coking coal is being imported annually by the steel plants for meeting their demand. Cement has emerged as the third largest coal consuming sector after power and iron and steel and consumed about 11.1 Mt in 1993-94. The coal consumption by all other industries in 1993-94 was slightly less than 10% of the total coal consumption. Railways who were the largest consumer till early 1970's have adopted the policy to phase out the steam locomotives by 2000 AD. The details of coal consumption by the major sectors are given in Table 1.4.

Table 1.4. Sector-wise coal consumption pattern (Mt)

Sector	1970-71	1993-94
Iron and steel	13.5	37.6
Electricity		
- Utilities	13.2	154.4 (4.5)
- Captive		13.0
Cement		11.1
Fertilizer	22.0	5.0
Paper		2.9
Textiles		1.8
Brick and other industries	15.6	23.1
Rail	6.9	2.0
Domestic and soft coke		5.1
Total	71.2	256.0 (4.5)

Note: Figures in parenthesis indicate middling consumption.

Coal movement

Transport modes employed for coal movement are mainly railways, road and captive modes like rail based merry-go-round system (MGR), conveyor belts and aerial ropeways. Coal requirement of some consumers in Southern India which include power stations and cement plants are met by moving coal by rail-cum-sea route. Haldia, Paradip and Vizag ports are the port which handle coal shipments. During the year 1994-95 about 10 Mt of coal was moved by rail-cum-sea route. Rail is the major mode of movement of coal in the country. In 1994-95, the railways carried 142.6 Mt of the total coal produced in the country. Since the coal production centres are concentrated in the eastern and central parts of the country, long distance movement of coal by rail becomes essential. However, the share of rail mode in coal transport has declined from about 70% in 1984-85 to 57% in 1994-95. This is largely because of increase in the movement of coal by MGR system whose share has increased from 6% to 19% in the same period. The pressure on the rail transport network is likely to increase further as the demand for coal increases in the future. In the last decade, movement of coal to pit-head power stations through MGR system has increased considerably. The details of mode-wise coal movement is given in Table 1.5.

Table 1.5. Mode-wise coal movement (Mt)

Mode	1984-85	1994-95
Rail	98.0 (70)	142.6 (57)
Road	27.0 (19)	47.3 (19)
MGR/own wagons	8.0 (6)	49.0 (19)
Belt	4.6 (3)	7.0 (3)
Ropeway	3.4 (2)	5.6 (2)
Total	141.0 (100)	251.5 (100)

Note: Figures in parenthesis indicate percent share.

Coal demand - future projections

Correct assessment of coal demand, coal consumption and satisfaction of consuming sector have never been attempted in a systematic manner. Even through several studies on coal demand have been done in the past, their projections differ widely and most of them are either based on aggregation of derived demand or take an average rate of growth for different consuming sectors. No proper market survey/industrial survey has ever been conducted. There is a continuously changing assessment of coal demand, production plans as also transport capabilities. Interaction among CMPDIL, MOC, Railways, Coal India and CEA results in continuous modification in coal production, transport and demand. As a result, the figures of demand projection and the flows of coal can not be established with any amount of certainty.

The Planning Commission has carried out an analysis of the sectoral requirements of coal in the 8th Plan based on the proposed targets of the consuming sectors. A sectoral break-up of coal demand for 1996-97 and 2001-02 are given in Table 1.6. The demand is expected to grow at an average annual rate of 6.3% during the 8th Plan and at 5.6% during the 9th Plan.

Table 1.6. Sector-wise coal demand (Mt)

Sector	1996-97	2001-02
Steel	40.5	41.40
Coke ovens	2.30	2.30
Sponge iron	3.20	3.60
Power (utilities)	187.70 (4.50)	268.60 (5.30)
Power (captive)	14.30 (2.70)	18.70 (2.70)
Railways	0.90	-
Cement	15.00	18.40
Fertilizer	4.70	4.70
Brick and other industries	23.80	27.6
Domestic fuel	3.10	4.30
Export	0.30	0.50
Colliery consumption	3.80	4.00
Total	299.4 (7.20)	394.10 (8.00)

Note: Figures in parenthesis indicate washery middlings.

Electricity sector

Electricity sector continues to be the single largest consumer of coal followed by steel and cement sectors. It can be observed from the table that the demand of coal (including middlings) of the power stations (utilities and captive) increases from about 172 Mt in 1993-94 to 295.3 Mt in 2001-02 showing an annual average growth rate of 7%. The growth in all other sectors is only marginal.

The demand of coal for power sector has also been projected by the Central Electricity Authority (CEA). As per their estimates the demand increases from 172 Mt in 1993-94 to 368 Mt in 2001-02 (utilities 350 Mt and captive 18 Mt) showing an annual average growth rate of 10%.

An analysis of the distance-wise requirement of coal for utilities was carried out. The policy of setting up new power stations at and near the pit-head would continue in the future. The details are given in Table 1.7.

Table 1.7. Distance-wise coal-demand for electricity sector (utilities only) - Mt

Distance	1994-95		1996-97		2001-02	
Up to 200 km	91.1	(54)	103.8	(55)	139.3	(52)
200 - 500 km	12.2	(7)	12.8	(7)	23.0	(8)
500 - 1000 km	16.0	(10)	15.9	(9)	15.9	(6)
> 1000 km	48.4	(29)	55.0	(29)	90.5	(34)
Total	167.8	(100)	187.5	(100)	268.6	(100)

Note: Figure in parenthesis indicate percent share.

The following points emerge from the table.

- The TPS located at pit-head and within 200 km consume about 54% of the total coal for power plants.
- The share of coal consumption in TPS located beyond 1000 km increases from 29% in 1994-95 to 34% in 2001-02 (in physical units the increase is about 42 Mt).
- The share of coal consumption in TPS located between 200 and 1000 km declines from 17% to 14%.

The mode-wise. distance-wise movement of coal for power stations has also been estimated and is given in Table 1.8.

Table 1.8. Projected mode-wise movement of coal for electricity sector (utilities only) - Mt

Mode	1994-95	1996-97	2001-02
Rail			
Upto 200 km	21.3	23.1	38.7
200 - 500 km	12.3	12.8	23.0
500 - 1000 km	16.1	15.9	15.9
> 1000 km	48.4	55.0	90.4
MGR	48.8	58.7	74.4
Others	20.9	22.0	26.2
Total	167.8	187.5	268.6

Coal production plans

Historically, coal production plans have been drawn up to match demands. The production plans for coal are based on the following major assumptions: (1) coal industry would be able to meet the demand for non-coking coal from the power and industry sectors and (2) demand of the steel sector would be partially met by import of low ash prime coking coal to the extent of 30–40% of their demand.

In the liberalized economic scenario with the reduction in import duty on non-coking coal from 85% to 35%, it is expected that some industrial consumers in southern and western coastal region may import superior grade non-coking coal. In addition, some cement plants in these areas which export cement can import non-coking coal duty free. Also the new power plants coming up in the private sector in these areas have the option to import non-coking coal for their consumption.

The company-wise and coalfield-wise coal production plans for 1996-97 and 2001-02 are given in Table 1.9. The coal production is expected to grow at an annual average rate of 5% during the 8th Plan and at 3.6% during the 9th Plan. Almost 50% of the total production in 2001-02 would be contributed by Rajmahal, North Karanpura, Singrauli, Korba, Ib valley and Talcher coalfield.

Table 1.9. Coalfield-wise production projection (Mt)

Company	Coalfield	Target 1995-96	Projection	
			1996-97	2001-02
ECL	Raniganj	17.64	19.53	23.24
	Mugma/Salanpur	3.59	3.45	2.99
	Rajmahal	8.52	10.02	13.02
	Sub-total	29.75	33.00	39.25
BCCL	Jharia	29.36	31.46	34.36
	Raniganj	0.09	0.09	0.09
	Mugma	1.05	1.05	1.05
	Sub-total	30.50	32.60	35.50
CCL	Giridih	0.38	0.45	0.45
	W. Bokaro	3.62	3.73	4.75
	E. Bokaro	11.08	10.68	9.30
	Ramgarh	2.50	2.60	2.60
	S. Karanpura	5.02	5.29	5.42
	N. Karanpura	12.41	12.65	19.48
	Sub-total	35.00	35.40	42.00
NCL	Singrauli	35.00	39.00	49.70
WCL	Wardha	16.90	18.04	17.87
	Umrer	2.37	2.22	1.92
	Patherkhera	2.60	2.36	2.26
	Pench-Kanhan	3.70	3.57	4.37
	Kamptee	2.68	2.81	3.08
	Sub-total	28.25	29.00	29.50
SECL	Central India	19.69	20.00	25.70
	Korba	31.06	33.00	40.75
	Sub-total	50.75	53.00	66.45
MCL	Ib valley	10.90	12.84	15.35
	Talcher	19.85	23.16	28.00
	Sub-total	30.75	36.00	43.35
NEC	North-East	1.00	1.00	1.25
Total	CIL	241.00	259.00	307.00
SCCL	Singareni	25.60	28.00	36.00
Others	Jharia and Bokaro	5.50	5.60	6.00
Total		272.10	292.60	349.00

CHAPTER 2

Profile of the transportation sector

Rail network

Indian Railway (IR) is the principal mode of transport in the country. In 1993-94 IR carried over ten million passengers per day and lifted more than a million tonne of freight traffic daily on a network spread over 62,462 route km covering 7,050 stations. Of the total tonnage of 359 Mt of revenue earning freight carried by the IR in 1993-94, the coal's share was 167 Mt, which was about 47% of the total. Therefore, coal is the first charge on the IR in respect of freight business. The share of seven bulk commodities namely: coal, steel, ore, foodgrains, POL, cement & fertilizer, which accounted for 70% of the total tonnage moved by rail in 1970-71 has increased to 91% in 1993-94 The movement of the selected bulk commodities and the freight earnings are given in Table 2.1.

Table 2.1. Movement of bulk commodities and freight earnings - IR

Commodity	1970-71		1993-94			
	Mt	Share (%)	Mt	Share (%)	Earnings (Rs. in crores)	Share (%)
Coal	**64**	**34**	**167**	**47**	**5193**	**42**
Iron ore & other ores	10	5	41	11	703	6
Cement	11	6	33	9	1047	9
POL	9	4	26	7	1460	12
Fertilizer	5	2	19	5	575	5
Foodgrains	15	8	27	7	971	8
Iron & Steel	22	11	13	4	1073	9
Total	196	70	326	91	11002	91

It can be clearly seen from the table that the share of coal in freight traffic and also as a revenue earner is much higher than any other bulk commodity. Figure 2.1 shows the growth of the rail freight traffic in the past 45 years.

Rail infrastructure

The rail transport requirement comprises mainly of line capacity, suitable and adequate number of wagons and engines, and suitable loading and unloading terminals. The line capacity i.e. the number of trains which can be run on a section/route, can be improved either by infrastructural inputs in track and signalling or by improvements in rolling stock design to achieve better speeds of trains. Within the same line capacity, throughput i.e. the number of wagons or tonnage which can be passed over a section, can be increased by improvements in rolling stock design to achieve longer trailing loads on each train. The Indian Railway has adopted the following strategies for increasing freight traffic.

- Replacing steam traction for goods traffic by diesel and electric traction.
- Introduction of higher horse power electric engines.
- Updating wagon designs: The 4-wheeler broad gauge wagons have been replaced by 8-wheeler Box 'N' wagons with air brakes. Each train pay load has increased from 1,450 tonne to 3,200 tonne.
- Reduced transit time by coal movement in block rakes with end to end running.
- Electrification of trunk and heavily worked routes.

Indian Railways fleet in 1994 consisted of 911 steam, 4174 diesel and 2117 electric locomotives. The wagon fleet was about 3.12 lakhs, comprising of 44% covered wagons, 32% open high sided wagons, 16% special box wagons and balance other wagons. IR is gradually replacing four-wheeler stock by box wagons having higher pay-load and speed potential for optimum utilization of line capacity.

In 1993-94, 54% of the freight was hauled by diesel and the remaining predominantly by electric traction (45%). This has been possible due to a deliberate policy of the IR to shift from steam traction to diesel and electric traction. Table 2.2 shows the gradual shift in the mode of traction.

Table 2.2. Traction profile of freight traffic on IR

Year	Percentage by type of traction (Freight)		
	Steam	Diesel	Electric
1960-61	94	5	1
1970-71	46	39	15
1993-94	1	54	45

Coal despatch by different modes

Coal despatches from pit-heads are through various modes. Rail and road modes constitute the most important means of coal despatches from the pit-head. In recent years the MGR system of coal movement has made rapid strides and in 1993-94 its share was 19% in the total movement, which was equal to the coal moved by road. In the future, the quantity to be moved by the MGR system would surpass road movement and would be the second largest mode after rail. The mode-wise coal despatches for a few selected years and the percentage share of each mode in the total despatches are given in Table 2.3.
Figure 2.2 depicts the inter-modal splits for the coal movement over the past few years.

Table 2.3. Mode-wise coal despatches (Mt)

Year	Rail	Road	Ropeway	Belt	MGR	Total	Coastal shipment
1977-78	77.5 (78)	17.3 (17)	1.4 (1)	2.2 (2)	2.0 (2)	100.3 (100)	0.7
1984-85	98.0 (70)	27.0 (19)	3.4 (2)	4.6 (3)	8.0 (6)	141.0 (100)	1.9
1994-95 (Est)	142.6 (57)	47.3 (19)	5.6 (2)	7.0 (3)	49.0 (19)	251.5 (100)	10.0

Note: Figures in parenthesis indicate percent share.

An analysis of the above table shows the following.

- While coal production during the 10 year period (1984-85 to 1994-95) increased by an annual average of 5.6%, tonnage lifted by rail increased by only 3.8%. The share of rail in the total coal movement has declined from 70% in 1984-85 to 57% in 1994-95. This reduction is mainly due to the pit-head power stations taking coal by MGR, which has increased from 6 to 19% during the same period.
- The quantity of coal moved by road has been increasing at an average annual rate of 5.8% during the last decade and has maintained its share at 19% in the total coal movement.
- The coal moved by ropeway and belt increased marginally from 8 Mt to 12.6 Mt, but the share of these modes has remained constant at 5%.
- The merry-go-round system for transportation of coal has been introduced in the early 1980s for supply of coal to thermal power plants at pit-head (TPS owned by NTPC). The system operates with dedicated rolling stock and rail systems. Two power plants owned by SEBs also use privately owned wagons on their captive rail network to carry coal from pit-heads. The coal carried by this mode registered a 6-fold increase from

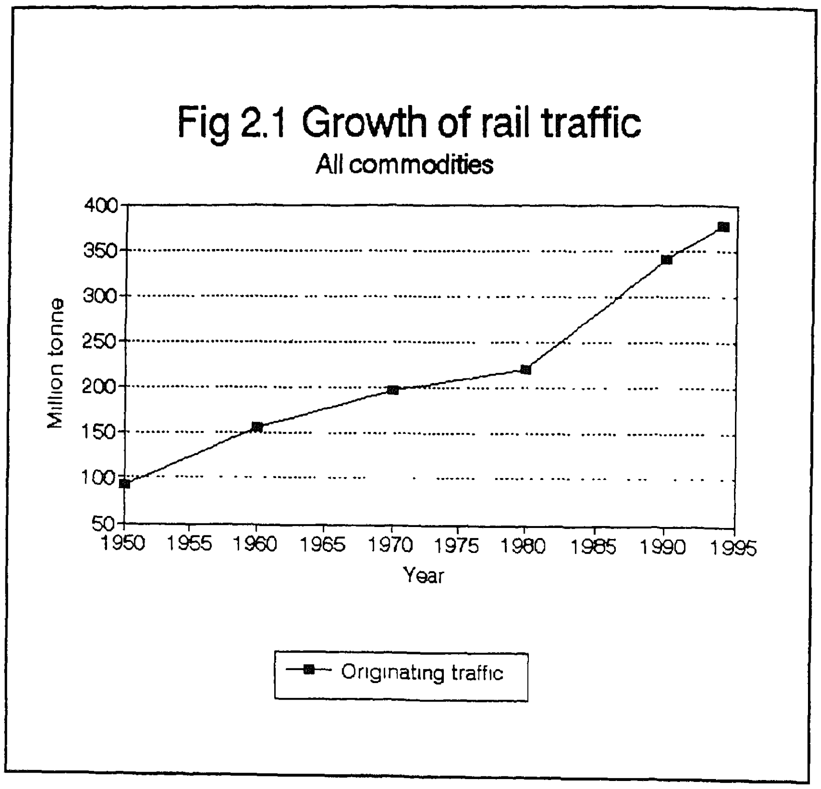


Fig 2.1 Growth of rail traffic

All commodities

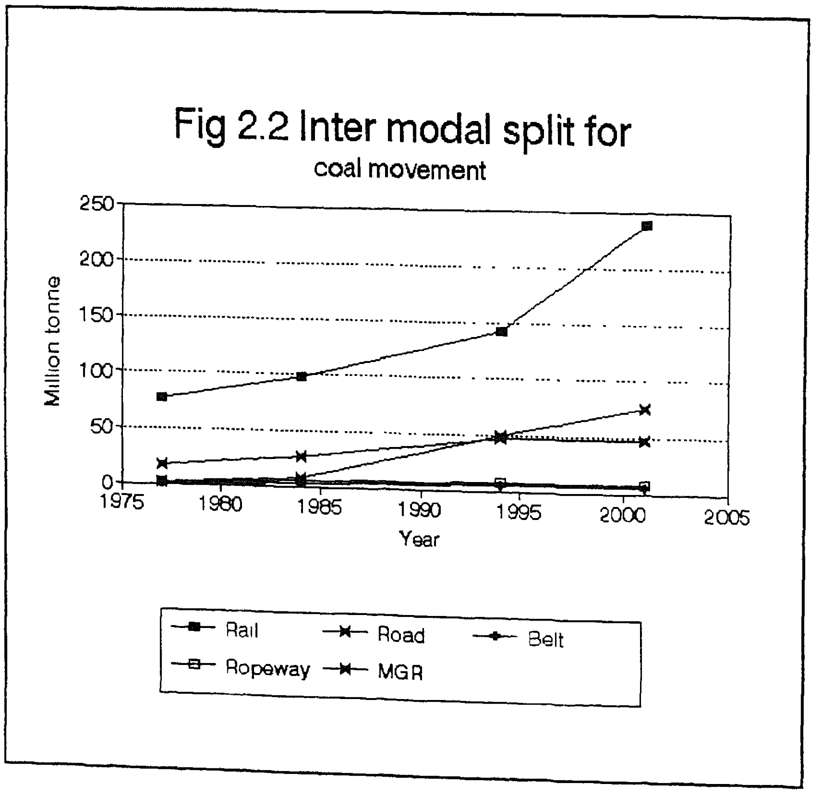


Fig 2.2 Inter modal split for

coal movement

8.0 Mt in 1984-85 to 47.7 Mt in 1993-94 and its share has increased to 19% in the total movement.

- The coastal shipment of coal started with linkages to Tuticorin power station from Raniganj coalfield. The coal used to be moved by ships from Calcutta port, but now it is moving from Haldia port. The coal handling ports are Haldia, Paradip, Vishakapatnam, Madras and Tuticorin. The coastal movement has been increasing consistently over the years with increasing demand from coastal power stations.

Status of the different modes of coal transport

MGR/own wagons

Pit-head power houses at locations close to coal mines presently draw their coal requirements through MGR/own wagons. A major future thrust would be to locate more power stations at pit-heads and the coal movement through this mode would increase. Details are given in Table 2.4.

Table 2.4. Existing status of MGR/own wagon system for coal movement

No.	Linked coalfield	Linked TPS	Distance from coal source (km)	Quantity moved in 1993-94 (Mt)
1	Singareni	Ramagundam	10.3	6.6
2	Korba	Korba	17.0	12.0
3	Singrauli	Singrauli STPS	8.5	8.9
4	Rajmahal	Farakka	38.0	3.6
5	Singrauli	Anpara STP	7.5	3.5
6	Singrauli	Vindhyachal	9.4	5.4
7	Singrauli	Rihand	19.0	3.6
8	Talcher	NALCO (captive)	6.0	-
9	Korba	BALCO (captive)	4.5	1.7
10	Talcher	Talcher STPS	18.0	-
11	Rajmahal	Kahalgaon	30.0	-
12	CIC	Amarkantak	10.0	1.0
13	Korba	Korba East	7.0	1.8

Ropeway/belt

14 units including 10 power plants located near pit-heads draw part of their coal requirement through ropeway and belt conveyor system. The total capacity of these systems is about 27 Mt/a, but the actual movement in 1993-94 was only 12.6 Mt. There are no major plans to increase movement of coal through these modes. The existing status of the ropeway/belt system is given in Table 2.5.

Table 2.5. Existing status of belt/ropeway systems for coal movement

No.	Linked coalfield	Linked unit	Capacity (Mt/a) based on 10 hrs operation for 350 days
	Conveyor belt		
1	Jharia	Chandrapura TPS	2.5
2	Korba	Korba West TPS	3.5
3	Patherkhera	Satpura TPS	2.5
4	Talcher	Talcher TPS	2.5
5	Jharia	Santaldih TPS	1.0
6	Jharia	Bokaro steel TPS	3.5
7	Singareni	Ramagundam FCI	1.4
8	Talcher	Talcher FCI	-
	Aerial ropeway		
1	Kargali	Bokaro TPS	1.5
2	Kamptee	Koradih TPS	2.0
3	Wardha	Chandrapur TPS	1.5
4	Singrauli	Renusagar TPS	1.5
5	Chasnala	IISCO steel plant	1.0
6	Singareni	Heavy water plant, Manuguru	1.5

Road

The transportation of coal by road is of two types: internal and external. Internal movement include transportation of coal from mine head to rail loading terminals and to coal washeries. The external movement involves transportation to consumers and falls under the following broad categories.

- Traditional short lead movements.
- Movement from non-rail linked collieries.
- Longer lead traditional road movements as leads by rail are longer.
- In emergency situations like failure of captive modes or railway's inability.

Coastal movement

Coastal shipment has emerged as an important mode of coal movement. It serves primarily to reduce rail leads after coal is initially carried from pit-head to linked ports. Haldia, Paradip and Vishakapatnam ports are shipping coal for Tuticorin and other consumers in south. The details of coal handling ports are given in Table 2.6. Many of the ports are already handling cargo more than their designed capacities. There are expansion plans for Paradip port to handle the increased volume of coal flows from Talcher coalfield. Since coastal movement has to increase for meeting the needs of consumers in the southern states, the coal handling capacities at Paradip and Vishakapatnam have to be substantially increased.

Table 2.6. Major ports: capacity and traffic handled in 1993-94 (Mt)

Port	Capacity		Traffic handled	
	All commodity	Only coal	All commodity	Only coal
Calcutta	6.75	-	5.17	
Haldia	16.78	5.00	13.33	5.43
Paradip	7.65	NA	8.33	4.69
Vishakapatnam	23.35	NA	25.59	6.58
Madras	22.07	NA	26.54	5.87
Tuticorin	5.10	3.00	6.70	3.81
Cochin	10.66		7.62	
New Mangalore	9.55		8.63	
Mormugao	15.92		18.72	
Bombay	26.80		30.74	
Kandla	20.80		24.50	
JL Nehru	5.90		3.39	
Total	171.03	8.00	179.26	26.43

Rail

Indian Railway is and will remain as the main mode of coal transportation in India. With the increase in despatch of coal in unit trains of Box 'N' wagons, this commodity is being increasingly moved in the express goods fleet. Being the first charge on the IR, the coal trains travel by the shortest or fastest routes and other traffic gets routed on secondary routes. With introduction of more and more special type stock (wagons and engine) line capacity constraints will start surfacing due to cross running of empty wagons of different types. One of the first studies to assess the adequacy of line capacity, and other infrastructure requirement for transportation of increased volume of coal traffic was carried out by RITES in 1988. This report identified the likely routes on which capacity constrains may get exposed. The actual coal flows in 1984-85 was taken as the baseline data and anticipated coal flows in 1989-90 were worked out based on projected demand from consuming centres. According to this study the critical sections/routes were as follows: Gomoh-Gaya, Sonnagar-Mughalsarai, Allahabad-Kanpur-Aligarh-Gaziabad, Bhusaval-Jhalagaon, Udna-Vadodara, Wardha-Bhusawal. Raj Kharaswan-Rourkela, and Champa-Bilaspur. The study also suggested remedial measures to overcome the line constraints in these sectors.

Existing coal routes - coal flows

A schematic route diagram showing coal density flows in 1994-95 and 2001-02 is given in Figure 2.3.

ER grand chord. All coal for up country from Raniganj, Jharia, Mugma-Salanpur and East Bokaro coalfields comes to Gomoh and moves on Gomoh-Gaya section. This moves on to Mughalsarai via Sonenagar. At Sonenagar the coal streams from Patratu, from North and South Karanpura coalfields join for up country movement. Thus the Sonenagar-Mughalsarai section becomes most critical as the up country movement for North Karanpura is very high in future - rising from 10 Mtpa to 24 Mtpa in 2001-02.

Mughalsari-Kanpur-Gaziabad ('A' route). Double line electrified route is the main coal route for Northern India.

Mughalsarai-Lucknow-Saharanpur ('B' route). Partially double line, this route is diesel and moves coal to up country consumers. 'A' and 'B' routes are supplementary to each other.

Garwah Road-Billi-Obra-Singrauli-Chopan. Coal to cement plants in the locality of Churk-Chunar and coal to Obra from Singrauli flows on this route.

Singrauli-Katni. This route was built to facilitate coal movement from Singrauli to power stations in the West - Wanakbori, Kota and Trombay. As it stands, about 8 Mtpa will move on this track from Singrauli by 2001-02, when Singrauli coalfield will be able to produce surplus coal after meeting the pit-head power stations demand. Presently this section is under utilized.

Bilaspur-Anuppur-Katni-Bina-Nagda-Dodhra/Anand.
Bilaspur-Bhillai-Nagpur-Bhusawal-Udhna-Godhra/Anand. Ib valley and Korba coal moves on this route to western consumers. Westward movement from Nagpur also joins the second route.

Southern movement. Most of the coal to south moves from Haldia, Paradip and Vizag ports. Some coal also moves on all rail route on the coastal line from Calcutta to Madras.

Future projections of coal movement (based on RITES report, 1988)

The RITES report also assessed the infrastructural requirements in rail network for a coal demand projections of 325 Mt in 1994-95 and 417 Mt in 1999-2000. As per the current projections, the coal demand is estimated at 300 Mt in 1996-97 and 394 Mt in 2001-02 (8th Plan was shifted by 2 years). As can be seen the demand projections are somewhat lower than the earlier projections. However, the general flow of coal traffic and the demand centres (mostly power stations) also remains similar to the earlier projections. Keeping in view the current status of coal flows and the future demand projections, the recommendations of RITES report are valid even today. The IR has already implemented many of the recommendations on line capacity while others are in the process of being implemented. The routes likely to bear the greatest increase in coal freight are given in Table 2.7.

Fig 2.3 SCHEMATIC ROUTE DIAGRAM SHOWING COAL DENSITY FLOWS 1994-95 /2001-02

MTPA

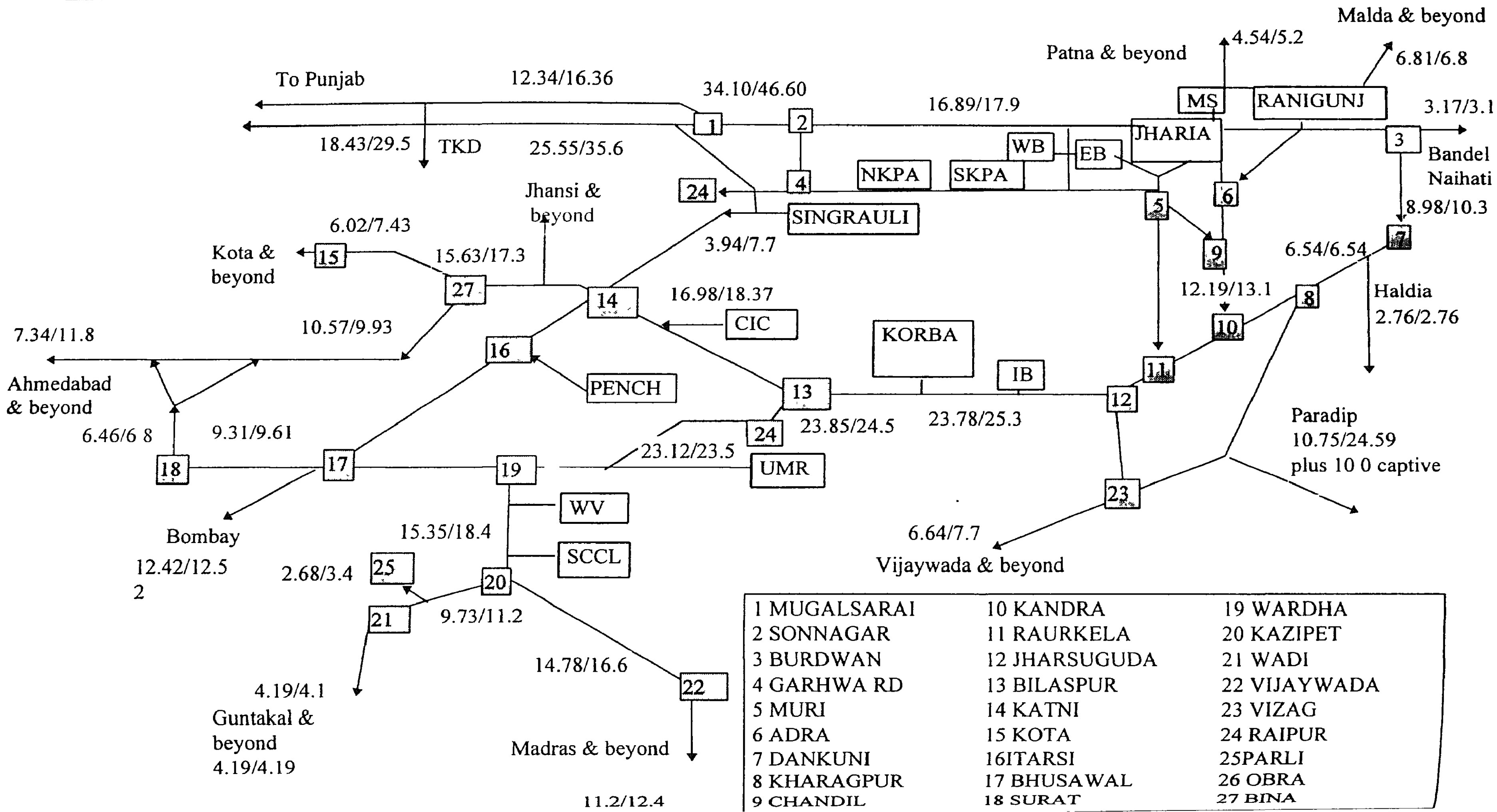


Table 2.7. Critical routes and projected coal traffic (Mt)

Route	1994-95	2001-02
Sonnagar-Mughalsarai	34.10	46.60
Mughalsarai-Allahabad	25.55	35.66
Jharsuguda-Champa	23.70	25.55
Bhilai-Nagpur	23.12	23.57
Wardha-Bhusaval	23.92	24.70
Bhusaval-Jalgaon	9.31	9.61
Jalgaon-Ukai	6.46	6.86
Balarshah-Kazipet	15.35	18.43
Talcher-Paradip	10.70	24.59

Some of the schemes already taken up by IR for line capacity augmentation are given below:

Route	**Activity**
Gomoh-Gaya	Construction of 3rd line between Gujhundi-Gurpa
Sonnagar-Mughalsarai	Construction of 3rd line
Mughalsari-Allahabad-Kanpur	Lengthening of loops Provision of automatic signalling
Bhopal-Nagda	Doubling of track
Bina-Kota	Doubling of track
Jharsuguda-Champa-Bilaspur-Bhillai	Construction of 3rd line
Anupur-Bilaspur	Doubling of track
Champa-Korba-Gevra Road	Doubling of track
Garwah Road-Chopan	Doubling of track
Billi-Singrauli	Doubling of track
Talcher-Paradip	Doubling of track

During discussions with the Railways, it emerged that the augmentation of the line capacity is being implemented as per plan and there will be no constraint for the movement of the proposed quantity of coal by the year 2001-02.

Future projections for coal movement (based on MOC, 1994)

The coalfield-wise coal demand for power stations and other consumers for 1996-97 and 2001-02 have been estimated by MOC and are given in Table 2.8.

Table 2.8. Coal demand for power and other consumers (figures in Mt)

Coalfield	1996-97			2001-02		
	Power	Others	Total	Power	Others	Total
Raniganj	9.8	8.2	18.0	12.4	8.3	20.7
Mugma Salanpur	2.9	0.8	3.7	1.0	0.8	1.8
Rajmahal	8.7	0.0	8.7	11.8	0.0	11.8
Jharia	10.6	21.9	33.2	12.2	23.0	35.2
Giridih	0.4	0.0	0.4	0.4	0.0	0.4
West Bokaro	0.0	4.1	4.1	0.0	7.3	7.3
East Bokaro	4.9	6.8	11.7	7.0	7.0	14.0
Ramgarh	0.0	2.7	2.7	0.0	2.7	2.7
South Karanpura	1.7	4.4	6.1	1.6	4.9	6.5
North Karanpura	**13.7**	**1.1**	**14.8**	**22.9**	**1.1**	**24.0**
Singrauli	**35.3**	**1.2**	**36.5**	**46.0**	**2.7**	**48.7**
Wardha Valley	12.5	4.7	17.2	13.1	5.2	18.3
Umrer	2.0	0.0	2.0	1.8	0.0	1.8
Patherkhera	1.9	0.2	2.1	1.9	0.2	2.1
Pench-Kanhan	1.7	1.8	3.5	2.1	1.9	4.0
Kamptee	2.6	0.5	3.1	2.6	0.5	3.1
Central India	9.2	11.5	20.7	7.7	15.0	22.7
Korba	**27.8**	**3.3**	**31.1**	**33.4**	**3.8**	**37.2**
Ib valley	**13.4**	**0.8**	**14.2**	**18.6**	**1.0**	**19.6**
Talcher	**21.4**	**1.6**	**21.0**	**44.0**	**1.8**	**45.8**
North-East	0.0	0.7	0.7	0.0	0.7	0.7
Singareni	21.3	7.1	28.4	22.4	7.9	30.3
Others	0.1	6.4	6.5	6.4	0.1	6.5
Imported coking coal	0.0	6.9	6.9	0.0	3.8	3.8
Total	**201.8**	**97.6**	**299.4**	**287.3**	**106.8**	**394.1**

As can be seen from the table, the coal demand increases rapidly in North Karanpura, Singrauli, Korba, Ib valley and Talcher coalfields. This would result in the following.

- The northern stream will see very heavy movement of coal on the Grand Chord of Eastern Railway and 'A' route of Northern Railway due to massive growth of coal production in North Karanpura and its linkage to Northern power houses,

- Jharsuguda-Nagpur-Bhusawal and Champa-Bilaspur-Katni-Bina route on the South Eastern and Central Railways and Talcher-Cuttack-Paradip lines on the East Coast will get heavily loaded by the quantum jump in Ib valley and Talcher, Korba and Singrauli coalfields.

Inter-modal split for future coal movement

Since power plants are the largest consumer of coal, the coal movement plans would depend mainly on the location of future power plants. The pit-head power plants would draw coal through captive modes like MGR/own wagons, but the distant power plants would have to depend on rail and rail-cum-sea modes for coal movement. It is also assumed that road movement would not increase in the future from the levels of 1993-94, since they are costly, except for short lead destinations. Rail however, would continue to remain as the most important mode and its share increases from 57% in 1993-94 to 64% in 2001-02. The projected mode-wise coal movement plans for 2001-02 is as follows:

Rail	235 Mt
Road	47 Mt
Ropeway/belt	12 Mt
MGR	75 Mt
Total	369 Mt

The mode-wise coal movement has been projected for a production level of 373 Mt in 2001-02 (Government sector 349 Mt + private sector 24 Mt). The coal demand is projected as 394 Mt in 2001-02 (as per Ministry of Coal). Therefore, the balance 21 tonnes is likely to be imported and part of it would be consumed in coastal power stations. The balance would be moved by rail to consuming stations. No change in the average lead of coal traffic is expected. It is likely to remain at about 1200 km on the northern stream, 950 km on the central stream and about 600 km on the southern stream.

Evacuation of coal from selected coalfields

The demand projections for the future clearly show that the build-up of production capacity is required mainly in North Karanpura, Talcher, Ib valley, Korba and Singrauli coalfields. The coal from North Karanpura is linked to power stations in the north and will follow the electrified 'A' route and Diesel 'B' route via Mughalsarai. The Talcher coal is mostly linked to the power stations in the south and will be shipped through Paradip port. The coal from Ib valley and Korba coalfields are linked to power stations in the west as well as some coastal power stations in the south and this will flow through Vishakapatnam port. The power stations in the west will get their coal supplies through the Katni-Bina route and Jharsuguda-Bilaspur-Nagpur-Bhusaval route.

In view of the above, heavy coal movement are likely to occur on Grand Chord of Eastern Railway, 'A' route of Northern Railway, Jharsuguda-Nagpur-Busawal route of South-Eastern and Central Railways, Bilaspur-Katni-Bina on main line and Talcher-Cuttack-Paradip on the east coast. The IR's plan for evacuation of the large increases in coal production from Talcher, North Karanpura, and Ib valley coalfields are discussed in the following paragraphs:

Talcher coalfield

The present loading arrangements at the collieries has to be augmented. The doubling of track upto Talcher station has already been taken up by the railways and on its completion the railways will be able to handle 24-30 Mt of coal through Talcher station. The doubling of railway track between Talcher and Paradip port via Cuttack has also been taken up by the railways. This stretch is about 191 km out of which 40 km have been completed. Two major bridges on Mahanadi and Birupa rivers will have to be constructed on this track. IR is facing problems of financing the total project.

In case the coal from Talcher cannot be fully absorbed by the coastal plants in south or the port facilities at Paradip and IR's plan for coal movement from Talcher to Paradip are not implemented, then the need for westward linkage will arise. A new broad gauge line is almost completed between Talcher and Sambalpur. A new broad gauge line between Bargarh to Raipur and strengthening of line capacity beyond Raipur will be required if westward movement of Talcher coal gets justified.

North Karanpura

The additional rail infrastructure being created to enable despatch from this coalfield are as follows.

- A separate rail line from Shivapur to Tori railway station - 40 km.
- Railway infrastructure from Piparwar OCP to Macluskiganj railway station.
- Electrification of rail line from Tori and Macluskiganj.
- Augmentation of loading arrangements at the colliery end.

Ib valley coalfield

All the future projects like Kulda, Basundhara will be located on the north side of the main line (Howrah-Bombay) and will need a comprehensive rail evacuation facility RITES have undertaken a study and submitted a report based on which a decision would be taken. It is understood that Railways have a proposal for the construction of a third line between Nagpur and Rourkela. In the first phase they have taken up Champa-Bilaspur-Durg section. In the second phase, Champa-Rourkela section will be taken up and in the third phase Durg-Nagpur section will be taken up.

Singrauli coalfield

Surplus coal of about 8 Mt in 2001-02 is linked to Kota power house in Rajasthan and Wanakbori power house in Gujarat. This will follow the Bina-Katni route. As per Indian Railway, there will be no constraint in movement as surplus line capacity exists in this route.

Infrastructural needs for handling large coal traffic

Loading and unloading arrangements at the terminals

Railways have now standardized Box 'N' wagons for movement of coal in rakes. For movement of 240-250 Mt of coal in 2001-02 by rail, a daily average loading of 25,000-30,000 wagons is necessary. As discussed in the previous paragraphs, the majority of coal loading would be concentrated in the potential coalfields like Talcher, North Karanpura, Ib valley, Korba and Singrauli. To achieve this, an efficient and highly mechanized loading and unloading arrangements are required at the terminals. Today, barring some rapid loading systems for MGR mode, coal is mostly loaded by pay-loaders into wagons, which takes 4-10 hours. The unloading arrangements at the power stations/consumer end are also primitive. No concrete plans exists with the coal industry or the major consumer for modernization of terminals. Unless the loading is done with engine connected to rake and is completed within 2 hours and similar arrangements for unloading at the consumer end is made, the target for movement of coal by rail may become impossible to achieve in spite of the availability of coal and the rail infrastructure.

Rolling stock

In their Corporate Plan 1985-2000, Railways have projected substantial improvement of wagon utilization. They have estimated that the additional requirement of all types of wagons would be around 20,000 units per year. Today, the Indian Railways have 3.12 lakh wagons for moving all commodities. The number of old wagons discarded every year have been much more than new wagons acquired and hence over the years the total number of wagons have declined. From about 4.1 lakh wagons in 1980-81 it has come down to 3.65 lakh in 1984-85 and to 3.12 lakh in 1993-94. However, IR acquired about 19,000 wagon units in 1993-94.

The acquisition of additional rolling stock depends on the turn-round of wagons. For instance, if the turn-round for coal trains is 10 days, then coal movement alone would require 2.5 lakh wagons which is roughly 80% of the total wagons available with the IR. The requirement of wagons for coal movement alone would increase to 2.9 lakh wagons in the year 2001-02. Improved turn-round of wagons will be essential to bring down the requirement of wagon fleet.

In the field of motive power also, the Railways propose to concentrate on improved traffic availability of the present fleet of electric and diesel locomotives. Railways expect that the improved utilization and new operating practices would help in this direction and that higher trailing loads with increased train speeds will further improve output of the present fleet. Technological improvements in the design of locomotives with higher availability, improved reliability, higher speed potential and reduced down-time would further help in controlling the acquisition of a larger number of locomotive units. Increased horse power or tractive effort would further reduce the number of locomotives to be acquired.

Rail tariff for freight movement

Rail tariff for transportation of freight and passenger is cross subsidized. Coal being the largest charge of rail, earns maximum revenue. Coal constitutes about 42% of all revenue traffic on rail. The tariff for movement of food grains, fertilizer, etc. is kept deliberately low while the tariff for coal transportation is kept comparatively at a higher level. This tariff is getting revised upwards every year and the average tariff today is about Re. 0.55/- per tkm. The rail traffic per tkm for coal movement in train loads gradually decreases from Re. 0.75/- for a haul of 100 km to Re. 0.54/- tkm for a haul of 1,300 km and to Re. 0.49/- tkm for a haul of 2000 km.

The tariff rates are for movement of coal in train loads. The present train size is almost standard now and consists of 58 Box 'N' wagons (3,300 tonnes) for large consumers in core sector. However, smaller consumers get coal in Box 'C' wagons amounting to 2,600 tones. Covered wagons are currently not being used for transport of coal but in the past they were used for smaller consumers needing smaller quantities (piece meal movement). There is no proposal of railways to introduce covered wagons for coal in the future.

Rail tariff for movement of coal in smaller quantities (wagons loads or smalls) draw higher rates. In general, coal is moving only in rakes to larger consumers and multi-consumer rakes are moved for smaller consumers.

Coal is not insured while it is being transported. The responsibility of producer ceases as soon as the wagons are drawn out of the siding by the transporter. Coal is sold as FOR. Thus any loss/theft in transit is borne by the consumer as the railways also do not accept the responsibility.

The loss in transit have been monitored by various producers as well as consumers. According to the data available, the loss in transit over a distance of > 1,000 km varies between 3 to 7%.

Own your wagon scheme of Indian Railways

To bridge the ever increasing gap between the requirement and availability of wagons Railways have now offered a scheme of 'Own your wagon' for movement of commodities. Under this scheme the consumers or a leasing company may invest in wagons which will be leased out to the Railways. There are three different schemes for leasing the wagons to the Indian Railways. The IR will operate the wagons and the benefits under each of the schemes are given in Annexure 2.1. The distant power stations would welcome the scheme since the supply of coal is guaranteed. Therefore, FMCI/Washing company can guarantee supply of consistent quality of washed coal as per specifications of the power station. In the coal purchase agreement, adequate weightage can be given to this point while working out the financial terms of coal supplies.

Indian wagon manufacturers are available for supply of adequate number of wagons as per IR's specifications. The installed capacity of wagon building in India is adequate to take care of future needs. The investment require of one rake load of box 'N' wagons (58 + 3 wagons) would be Rs. 40 to 50 million. As regards backhauling of wagons, in our opinion, in case of coal trains this may not be feasible. After unloading at the power station, in general, the coal train moves back empty to the coalfield area for fresh loading. Moreover, once the wagons are released to the IR, backhauling of wagons would depend on their plans. In case they do that, the owner of wagons would be compensated under one of the schemes of leasing.

Annexure 2.1. Own your wagon scheme of Indian Railways

1. Objective

To enhance the rail transport capacity to meet the needs of various sections of the economy by encouraging private participation in ownership of wagons and thereby supplement the resources available with the Railways for acquisition of rolling stock.

2. Profile of ownership

2.1 Ownership of wagons under this scheme could vest in:

i) Individuals as producers
ii) Corporate entity as producers
iii) Association or group of companies, such as, integrated steel plants of SAIL or a group of cement companies in a 'cluster', etc.
iv) Thermal power stations and other major consumers belonging to the Core Sector.
v) Leasing companies.

3. Mode of procurement

3.1 Directly by the owner from wagon builders approved by Ministry of Railways, subject to current IRS designs and specifications, inspection by nominated agency of Indian Railways and on payment of design loan and inspection charges to the Indian Railways amount to one and a half percent of the cost of wagons. All critical components will be procured from RDSO approved sources and to current IRS specifications.

Or

Through the Indian Railways on payment of a 'service charge' of three percent of the cost of the wagons which would cover design loan, inspection and administrative charges of procurement.

3.2 The foreign exchange or its equivalent, if any, for imported components would be provided by the owner.

4. Extent of private ownership

4.1 Users can own any number of wagons without any ceiling to the extent required by them, subject to a minimum of one rake. Four percent additional wagons will have to be provided as maintenance spare by the owner.

4.2 The Railways would like the owners to own wagons only in units of rake loads with requisite number of wagons as maintenance/spares, not in piecemeal.

5. Pattern of movement

5.1 Such wagons may operate:

i) Merge and operate in the general pool of wagons of the Indian Railways, or
ii) Within closed circuits, or
iii) From a specific point of origin to a cluster of destinations, or
iv) From a cluster to a specific destination.

5.2 The circuits over which these wagons would operate would be mutually determined by the Railways and the owner of the wagons.

6. Benefits admissible to owners - Pure lease

6.1 Category A - Pure lease

6.1.1 Annual lease charges will be paid by the Indian Railways to the leasing companies on quarterly basis in advance. The lease charge will be calculated on the current costs of similar wagons owned by the Indian Railways (excluding the design loan, inspection service charges) at the rate of 16% per annum for that particular group of wagons for a primary period of ten years followed by a one percent annual lease charge for the next ten years.

6.1.2 At the end of 20 years period the condition of these wagons will be examined by the Indian Railways so as to find our whether they are operationally and mechanically fit for further retention in service. If the wagons are found to have outlived their economic life and are not found mechanically and operationally fit, the owner will be entitled to dispose of the same as scrap either directly or indirectly or through the Railways, if the owner so likes.

6.1.3 If the wagons are found mechanically and operationally fit for further service after the expiry of the 20 years period, the lease would be continued on mutually agreed terms.

6.2 Category B - Lease cum guaranteed clearance with general service wagons

6.2.1 In addition to the benefits listed out for Category A, the following benefits will also be admissible to Category B owners.

6.2.2 Under the scheme, Indian Railways will enter into an agreement with the Owner/Users Unit for guaranteed clearance of the mutually agreed specified quantum/tonnage of the specific commodity/product during a specified period.

6.2.3 The above guarantee will be subject to the following:

a) Preferential traffic schedule
b) Rationalization scheme
c) Conditions of booking of goods traffic
d) Provisions of Railway Act
e) All Central Government and State Government bans/restrictions
f) Operating restrictions
g) All other policies of Railways

6.2.4 Freight would be charged at normal tariff rates.

6.3 Category C - Guaranteed clearance with special wagons

6.3.1 Lease charges will not be payable to the owners of special wagons moving in dedicated circuits and involving empty running in one direction.

6.3.2 A lump-sum freight rate mutually negotiated would be quoted for the identified dedicated movement taking into account the cost of haulage in the loaded and empty direction, terminal, marshalling and other costs The lump-sum rate would be subject to revision every year along with the annual Railway Budget exercise.

7. Maintenance of wagons

7.1 Category A and B

7.1.1 Owners will not be required to pay any maintenance charge for wagons.

7.1.2 Indian Railways will be at liberty to make the same modifications/changes on these wagons which they would carry out on their own wagons of similar design at owner's cost. However, minor modifications which are a part of the maintenance will be done at Railways' cost. In case the modifications and changes on these privately owned wagons carried out at owner's cost, result in sizeable increase in the cost of wagons, this additional cost will also qualify for lease charges for the remaining period of the contract.

7.2 Category C

The maintenance of wagons will be undertaken by the Indian Railways at costs mutually agreed to. The maintenance charges will be determined on case to case basis to be borne by the owner.

8. Wagons involved in accidents

8.1 In the event of privately owned general service wagons getting condemned as a result of accidents, the payment of lease charges for the condemned wagons will continue to be paid as per the lease agreement for the full contractual period of 20 years. The IR will also continue to meet the commitment of guaranteed clearance during this period.

8.2 In the event of dedicated wagons getting condemned as a result of accident, the IR will pay the depreciated value/referred to in para 11 (minus scrap value) of the wagon at the time of condemnation. The commitment of guaranteed supply will cease.

9. Failure to maintain guaranteed clearance of specified tonnage - General service wagons

9.1 The guaranteed clearance of the specified quantum of tonnage would be monitored on a monthly basis. In case there is a shortfall in any particular month the IR will make good the shortfall in the following month. If, however, the shortfall is not made good the IR will reimburse the wagon owner a penalty of Rs. 4 per tonne in addition to the lease charges.

9.2 In case the owner is unable to use the guaranteed specified number of wagons to achieve the specified quantum of tonnage the lease charges will not be payable for the number of days the wagon remain unutilized. The number of wagons idling will be stabled in the owner's sidings to the extent the lessor has contributed for the duration for which lease charge payments are to be withheld. However, should the IR be in a position to use wagons for traffic, the lease charge will continue to be paid.

10. Free time and demurrage rules

10.1 The free time and demurrage rules applicable to Railways owned wagons will be applicable to the wagons under private ownership also.

11. Buy back arrangements

11.1 If at ny time during the currency of the lease period the lessor/owner wishes to terminate the arrangement on account of liquidation/merger with any other company or due to any alteration in the agreement made by IR in terms of para 12 which are not acceptable to the lessor/owner, or any other reason acceptable to the Indian Railways, the ownership of the leased wagons would revert to the Railways on the 1st of April of the next financial year at the depreciated rates. The depreciated value would be determined according to the Income Tax Rules as applicable from time to time.

12. Changes in the scheme

12.1 The terms of the Scheme may be altered with mutual consent by the Indian Railways at any time after obtaining the consent of the lessor/owner.

CHAPTER 3

Coal trading market in india

Colliery control order

Coal is an essential commodity under the Essential Commodities Act. Its acquisition, transport and transfer is inter-alia controlled by the Colliery Control Order, 1945 which order has been continued under the Essential Commodities Act. Most of these controls had been withdrawn in 1967, but were again enforced on coal produced from the mines of Coal India through a government notification dated June 4, 1992. However in the notification of June 1992, the coal sold from Coal India mines under the liberalized sale scheme without actual user condition has been exempted from the provision of the colliery control order. Relevant extracts from the Colliery control order and copies of notifications issued in 1967 and 1992 are enclosed vide Annexure 3.1.

Distribution of coal

Priorities, sponsorship and rationalization rules of railways

Due to paucity of rail transport as also limited availability of higher grades of coal, administrative control on the allotment and movement of coal has been continued in as much as priority is being given to the actual users of coal. Distribution was inevitably regulated by the railways within their overall operational capacity. There are three major elements in the system of coal distribution which were retained even after decontrol. These are

- System of fixing priorities of industries for supply of coal.
- System of sponsorship.
- Rationalization rules of the railways.

System of priorities

A system of priority for different coal consumers was evolved as early as in 1945 in terms of which the important consumers like railways, power houses, steel plants, cement plants, defence, etc. were given higher priority while others were placed lower down in the list according to their relative importance so as to ensure preference to the more important consumers. The core-sector consumers consists of power, steel, defence, fertilizer and cement. The non-core sector consists of all other consumers covering industries and domestic sector.

System of sponsorship

Together with the system of priorities, a system of sponsorship was also introduced in terms of which the different industries were divided into two categories, eg. (a) centrally sponsored industries and (b) state sponsored industries. Central and State Governments have nominated various agencies to sponsor the demand for various priorities controlled by them. Approximately 70% of the total movement is sponsored by the States. Recommendations for the core sector are accepted in full while for the non-core sector are accepted within the ceiling limit notified by the nominated agencies. These ceiling limits are decided upon by the Railways.

Rationalization rules of the Railways

The existing rationalization scheme was formulated in 1953 by the Coal Controller in consultation with the Ministry of Railways after taking into consideration the movement capacities available on different sections of Railways and the need for economy in transport. The basic principle of rationalization scheme has been to transport coal from nearest source and by eliminating cross movement of the same type of coal and to develop the rail capacity accordingly from time to time. According to Railways, indiscriminate movement of coal on the principles of free market or consumer preference would throw the entire transport system to chaos as coal accounts for one-third of the traffic carried by the Railways. The Railways therefore, play the most vital role in coal transport and have the greatest control on it.

Coalfield-wise coal availability

This is an important factor for drawing a distribution plan. In 1951, 90% of the coal output came from Bengal-Bihar coalfields and this has decreased to about 36% in 1994. Production from outlying and other coalfields have been growing during the last three decades. This has resulted in change in production bases. The change in production and consumption centres and their different growth rates is giving rise to a more complex situation and therefore a well planned coal marketing and distribution system is essential. The different railway guiding rules viz. sponsorship, priorities, rationalization of movement, etc. exercise a severe control on physical distribution of coal. The factors to be considered in preparing a distribution plan are summarized below.

- Quantitative and qualitative demand.
- Source of supply.
- Mode of transport.
- Geographical proximity of consumer and economy of landed cost of coal.

Demand linkage system

Power and cement sectors

There is a demand-linkage system for the core sector (power, steel, cement, railways and defence) and non-core sector consumers (all other industries). A standing Linkage Committee was first constituted by the Government in 1973 to arrange and coordinate the supplies of coal to thermal power stations. Subsequently coal supplies to cement industry was also entrusted to this committee. The committee has representatives from departments of coal, power, railways, central electricity authority and planning commission. The committee determines the quantity and quality of coal required and the coalfield from which coal is to be supplied to the power houses and cement plants. The committee meets once in a year for working out long-term linkages and meets once in a quarter for periodic reviews. With a view to work out mine-wise details of linkages for power houses, the Standing Linkage Committee has set up four Regional Linkage Committees for the four different regions of the country. These are (i) Eastern Regional Linkage Committee (ii) Northern Regional Linkage Committee (iii) Western Regional Linkage Committee and (iv) Southern Regional Linkage Committee. These Regional Linkage Committees meet soon after the meeting of the main Linkage Committee to consider mine-wise break-up of the linkages, which are broadly fixed, coalfield-wise by the main Linkage Committee. The local problems with regard to coal supplies from the linked mines are also sorted out in the meetings of the Regional Linkage Committees.

Iron and steel sector

Another standing linkage committee was constituted in 1977 for linking coal supplies to steel plants. The distribution of coking coal to steel plants is controlled by coal controller who holds monthly allocation meetings with the coal companies, steel plants and railways.

Long-term linkages

The long-term linkage covers the production and consumption centres and the transportation links in detail and draws up linkage plans. This includes a study of the

- Geographical location of existing and planned production points.
- Quality-wise production targets and actual production in the last five years and future plans.
- Despatch arrangements at production points - existing and planned.
- Geographical location of consumers and existing consumption pattern and future requirements.

- The quantities moved by different modes in the last 2-3 years and alternative modes available for transport in the future and their capacities.
- Optimizing transport cost to the extent feasible.

Non-core sector consumers

Linkage system

The non-core sector consists of a host of industries like brick, textiles, paper, chemicals, glass, ceramics, refractories, jute, tea, etc. All consumers in the non-core sector having a projected requirement of upto 5,000 tonnes of coal per month are required to obtain a linkage from Coal India in respect of grade, size and source. The linkage is issued by the Non-core sector Linkage Committee constituted by Coal India. The consumers having requirements of more than 5,000 tonnes per month are required to obtain clearance from Ministry of Coal for linkage. After receiving clearance from the Ministry, the Coal India issues linkage.

There are thousands of units operating in the non-core sector. The major industries like paper, heavy chemicals, textiles draw coal directly after linkage is obtained. The other units obtain their coal through a number of middlemen who are operating in the capacity of handling agents, transporters, financiers, etc. Even through the middlemen cannot be traders, (as per Colliery Control Order) they do indulge in trading. Now with the liberalized sale scheme, many of them are trading in coal.

Coal consumption and demand

Except for some of the major sectors like textiles, heavy chemicals, paper, sponge iron, etc. reliable data on coal consumption in the non-core sector is not available. The consumption of all these industries and brick manufacturing and captive power generation is clubbed together under the title 'other industries' in the coal statistics. The Working Group on coal and lignite for the 7th Plan made an attempt to segregate the requirements of the various sub-sectors like brick manufacture, mini-cement plants, textile, paper, glass, ceramics and refractories as well as captive power plants. The Working Group on coal and lignite for the 8th Plan made demand projections for the above industries upto 1994-95. The overall demand was assessed by assuming an annual growth rate of 4% over likely consumption in 1989-90. However, the actual consumption in 1993-94 as reported in the Coal Controllers statistics is lower than the demand projections made by the Working Group. The details are given in Table 3.1.

Table 3.1. Coal consumption and demand in non-core sector (Mt)

Sector	1989-90[1]	1993-94[1]	1994-95[2] (Projected)
Brick burning	6.5	9.0	6.9
Textile	2.7	1.8	3.0
Paper	2.9	2.9	4.0
Glass, ceramic and refractories	1.3	1.0	0.7
Heavy chemicals	1.3	NA	NA
Other remaining industries	12.6	13.1	19.4
Total	27.3	27.8	34.0

Sources:

1. Coal Controller's Report
2. Working Group on Coal and Lignite for the 8th Plan.

It can be observed from the table that the estimated coal consumption in the non-core sector industries has marginally increased from 27.3 Mt in 1989-90 to 27.8 in 1993-94 as against a demand of 34 Mt in 1994-95 projected by the Working Group for the 8th Plan. The coal consumption is much lower than the projected demand. The coal consumption in textiles, glass, ceramics and refractories is showing a clear declining trend. The consumption of the other industries is more or less stagnant or declining. The coal demand from brick units is assumed to increase due to increase in demand for bricks. The projections for 2001-02 is estimated at 27.6 Mt (refer Table 1.6). Therefore, it can be concluded that, even though there would be growth in the non-core industries, the coal demand is stagnant. Many of these industries are gradually shifting to other fuels and also reducing their overall energy consumption through improvements in energy efficiency. It is expected that coal consumption by brick units would increase but this increase would be offset by a declining demand from other industries.

Coal stock-yards

With a view to improve the distribution of coal to the non-core consumers, the Government decided in 1980, that Coal India should open a network of stockyards to cater directly to the needs of the small consumers. 37 stockyards in different consuming centres were opened and operated by private agencies under the supervision of Coal India. Fifty percent of these stockyards were in the state of West Bengal. Despatches of coal to the dumps were by road and rail. The performance of the stockyard was not satisfactory in that they were not able to meet the demands of the small consumer. Therefore, in 1985, Coal India appointed a committee (Kumaramangalam Committee) to review, in depth, the existing system of operating the coal stockyards and suggest measures for improvement and also for enlarging stockyard operations. The committee submitted a detailed report on the issues involved. Some of the recommendations were

- Stockyards should be operated by CIL with a view to achieve the objectives of ensuring effective qualitative and quantitative distribution of coal to the consumers.
- Coal movement to stockyards in general should be by rail and should enjoy priority for movement next only to public utilities.
- The setting up large stockyards with mechanized coal handling arrangement should be explored. This would depend on a market segment to be attached to the stockyard of not less than 1 lakh tonne/month. Suitable railway or other land should be made available for this purpose by the railways with railway siding facilities to handle coal rakes.

The committee's recommendations were never implemented. At present, there are 27 stock-yards being controlled by Coal India and most of them are on the verge of closure. So, the government has recently decided that the responsibility for setting up and managing new stockyards should rest with the respective State Governments. Coal companies will offer coal for despatch to these stockyards in accordance with the sponsorships provided by the State Governments. Coal India has already approached the State Governments to take up the responsibility of setting up and managing the stockyards.

The subject of setting up of large stockyards with facilities to handle coal mechanically at or near important consumption centres can play an important role in the coal marketing and distribution system. The stockyards can be owned and operated by private companies with expertise in coal trade and handling.

Liberalized Sale Scheme (LSS)

In April, 1985, Coal India had introduced a scheme under which anyone could purchase upto 500 tonnes of coal from certain collieries/stockyards. The response to this scheme was limited and the total quantity offered/lifted under the scheme was very low. With a view to making coal freely available to small scale industries and other consumers, specially those located near the mines, the Liberalized Sales Scheme was reactivated and made more effective from September, 1990. The upper limit of quantity of coal that could be lifted by any consumer at a time was also increased to 1,000 tonnes. Even this did not attract large scale response from the industries. In February 1992 Coal India again launched a special 'Liberalized Sale Scheme', to reduce their pit-head stocks, which have been accumulating over the last few years. For this purpose CIL identified the collieries holding large stocks into four categories:

Category 1	Stocks lying in collieries within 3 km of railway sidings.
Category 2	Stocks lying in collieries beyond 3 km of railway sidings.
Category 3	Pit-head stocks in collieries, which are captive to consumer points like Thermal Power Stations; and
Category 4	Stocks in collieries which are linked only by roads.

It was decided that the stocks under category (2) and (4) would be transported to special coal dumps to be opened immediately. The stocks would be offered for sale without restrictions but subject to a minimum of 10,000 tonnes. However, priority would be given to special consumers, like manufacturers of cement, paper, textile, glass, lime, small industries, brick kilns, etc. The sale price will be fixed as per sampling and testing done by representatives of Coal Controller and Coal India Limited. The price would also include the cost of processing and transport.

The buyers under the Liberalized Sales Scheme have been categorized as actual users, mini traders, wholesale traders and other interested buyers. The first preference in order booking and despatches under LSS would be given to actual users who can draw coal for their own use in addition to the normal supplies being received by them against sponsorships/linkages. Second preference would be given to mini traders registered with coal companies. Third preference is given to the wholesale traders appointed by the coal companies subject to availability after meeting orders booked by first two categories. The remaining quantity is allocated to other interested buyers. The Railways have agreed to consider moving the coal offered under LSS by rail.

The response under the Liberalized Sale Scheme has been encouraging. The despatches under the Liberalized Sale Scheme has increased from 1.35 Mt in 1986-87 to 5.15 Mt in 1993-94. The LSS was instituted to facilitate such consumers who need very small quantity of coal and it is not possible for them to get the necessary sponsorship for purchase of coal. LSS has become, by default, a mini system of trading of coal in India on a minuscule scale.

Agreement for supply of coal to consumers

Core sector consumers

At present there is no long term contract for supply of coal to core sector consumers. During 1985 the agreements for supply of coal to utilities of some state electricity boards were prepared and accepted. A copy of one such agreement is enclosed vide Annexure 3.2. The agreement was valid for a period of 1 year. Some major items of the agreement were as follows.

- Penalty clause for supply of over size coal.
- Idle freight and penal freight charges payable to railways due to under-loading and over-loading of wagons to be deducted from coal bills.
- The payment for quality of coal was based on joint sampling and analysis.
- There was a provision for bonus/penalty within a specified grade.

Over the years between 1985 and 1995, in spite of discussion at various levels between the coal and power companies, no formal agreements for supply of coal could be drawn. The power sector was unilaterally deducting from coal bills for poor quality, under-loading/over-loading, etc. In 1995, the Coal India has decided that the sale of coal to power houses would be on the following terms.

Payment terms

- Power companies shall open an irrevocable Letter of Credit (LC) in favour of their suppliers (CIL) to the tune of 105% of their past average monthly billing.
- Advance payment equal to 10 days' value of monthly linkage as per SLC to be paid before 1st June 1995. Despatch from 1.6.1995 will be limited to such advance payment made and thereafter, fresh advance has to be paid for continuity of despatch. Despatches will be discontinued if advances are not paid. Such replenishment of advance may be made at interval of 10 days.
- 100 percent payment of bills raised by the coal companies within 48 hours of presentation backed by a Letter of Credit to cover 10 days value of supply. Coal companies will utilize the LC in all cases where bills are not paid within 48 hours.

Credit notes by coal companies to power companies

- Wherever a system of joint sampling at loading end exists the credit note will be issued on the basis of result of such sampling.
- Wherever a system of joint sampling at loading end does not exist but sampling and analysis is done by the Coal Controller's Organization at loading point, credit note

will be issued on the basis of result of such analysis and sampling by Coal Controller's Organization.

- Wherever neither joint sampling nor sampling and analysis by Coal Controller's Organization is done at loading point, credit note will be issued on the basis of result of sampling and analysis done by Public Analyst who have been appointed by the coal companies. Such credit note will be issued on month to month basis within a fortnight of close of the month.

It is clear from the above, that there is no penalty/bonus clause on quality of coal or over size in coal supplies. However, for under-loading and over-loading of wagons, the power sector continues to deduct from the coal the idle freight and penal freight charges payable to the IR. In addition, there is no supply guarantee because the IR is the transporter and they are not involved in the agreement between the supplier and the consumer.

Non-core sector consumer

The coal supply to the non-core sector consumers is on 100% advance payment basis. There is no formal agreement and there is no guarantee for supply of the sponsored quota.

Annexure 3.1. Extracts from Colliery Control Order, 1945

12A. The Central Government may, by notification in the Official Gazette, specify the authorities competent to allot quota of coal to any person or class of persons and every such authority shall allot such quota subject to such instructions as the Central Government may issue from time to time.

12B. A person who has been allotted coal under this order shall not use it otherwise than in accordance with the conditions contained or incorporated in the document containing the order of allotment and shall not divert or transfer any such coal to any other person except under a written authority from the Central Government and at such prices as may be fixed by that Government and in fixing such price the Central Government shall have due regard to the prices fixed under clause 4 of this order and the freight, cesses, taxes, middleman's commission and other incidental charges, including supervisory and storage charges paid by the original allotted.

12C. Where, on any information received or otherwise, the Central Government is satisfied that a person who has been allotted coal under this order does not require the whole quantity of the coal so allotted to any part thereof for the purpose for which it was allotted, the Central Government, may, by order in writing, direct such person to deliver the whole quantity of such coal or any part thereof, as the case may be to such person and at such price as may be specified in the order.

12D(1) Every person who has been allotted coal under this order shall maintain a record containing the following particulars namely:

a) the quantity of coal allotted of each grade and size,
b) the quantity consumed of each grade and size of coal,
c) the purpose for which it was consumed.

12D(2) The Central Government, with a view to satisfying itself, that any coal allotted under this order is utilized for the purpose for which it was allotted may call upon any person to submit such information or returns as the Central Government may deem fit.

12E. No person shall acquire or purchase or agree to acquire or purchase any coal from a colliery and no colliery owner or this agent shall despatch or agree to despatch or transport any coal from the colliery except under the authority and in accordance with the conditions contained in general or special authority of the Central Government.

12F. The Central Government may, for the purpose of securing compliance with the provisions of clause 12E, specify from time to time the officers to whom applications for permission to transport coal may be made by colliery owners, middleman or persons to whom coal is allotted, the periods within which and the form in which, such applications may be made, the particulars to be entered therein and any other matters incidental thereto. The functions of the Central Government under clause 12E shall also be exercisable by the officers so specified.

12G. Notwithstanding anything contained in clauses 12A, 12B and 12E of this order on and from the 15th Day of September, 1975 any person may, without any order of allotment or authority:

a) acquire or purchase or agree to acquire or purchase; or
b) despatch or agree to despatch or transport; or
c) divert or transfer.

Hard coke produced from bee-hive ovens, country ovens and by-product ovens:

Provided that nothing in this clause shall apply to hard coke in respect of which a direction is issued by the Central Government under clause 8 of this order.

Notification under Colliery Control Order

New Delhi, the 24th July 1967

S.O.2464 - In pursuance of clauses 12B and 12E of the Colliery Control Order, 1945, as continued in force by Section 16 of the Essential Commodities Act, 1955 (10 of 1955) the Central Government hereby authorizes a person:

a) to acquire or purchase or agree to acquire or purchase,

or

b) to despatch or agree to despatch or transport,

or

c) to divert or transfer,

without any order of allotment or written authority, Non-coking Coal of all grades produced in all coalfields, Coking Coals not required for metallurgical consumers and coal produced in Assam.

Provided that such coal shall be consumed within India.

Notification

New Delhi, the 4th June, 1992

S.O.393(E) in pursuance of clauses 12B and 12E of the Colliery Control Order, 1945, as continued in force by Section 16 of the Essential Commodities Act, 1955 (10 of 1955), the Central Government hereby makes the following amendment to the notification of the Government of India in the late Ministry of Steel, Mines and Metals (Department of Coal) No.S.O.2464 dated the 24th July, 1967, namely:

In the said notification, for the words beginning with 'without any order of allotment', and ending with the words 'consumer within India', the following shall be substituted namely:

"without any order of allotment or written authority

A (i) non-coking coal of all grades produced in the States of Assam and Meghalaya.

(ii) coking coal produced in the States of Assam and Meghalaya, which is not required for metallurgical consumers.

Provided that such coking/non-coking coal is not produced in the coal mines of the Coal India Limited or any of its subsidiaries; and

B the coal sold under any Liberalized Sales Scheme, framed by the Government of India in the Ministry of Coal, by the Coal India Limited or any of its subsidiaries, and the Singareni Collieries Company Ltd., if such sale is not dependent on the condition that such coal would be used by the first purchaser only and is not meant for trading or sale".

This amendment will come into effect from 1st of July 1992.

Annexure 3.2. AGREEMENT FOR SUPPLY OF COAL TO M.P.ELECTRICITY BOARD POWER STATIONS BETWEEN WESTERN COALFIELDS LIMITED AND M.P. ELECTRICITY BOARD.

PREAMBLE:

This contract is made this 15th day of May 1985 between the Western Coalfields Limited, a Company registered under the Company Act, 1956 and having its registered office at Coal Estate, Civil Lines, Nagpur - 440001, hereinafter called the "Supplier" (which term shall unless excluded by or repugnant to the subject or context include its heirs, legal representatives and successors) of the onepart and the M.P. Electricity Board constituted under Section 5 of the Electricity (Supply) Act, 1948 andhaving its Head Office at Rampur, Jabalpur hereinafter called the 'Purchaser' (which term shall unless excluded by or repugnant to the subject or context include its heirs, legal representatives successors and permitted assigns) of the other part.

Whereas the Purchaser hasrequested the Supplier for supply of coal from the collieries/mines linked by the Standing Linkage Committee to the various Power Stations of the Purchaser and the Supplier has agreed to make such supplies on the terms & conditions set out hereafter:-

Now, THEREFORE, IT IS HEREBY DECLARED AND AGREED AS FOLLOWS:

GENERAL:

The Purchaser shall take andthe Supplier shall supply slack coal on the terms and conditions contained in this Contract and the parties hereto shall respectively abide by and submit themselves to such terms and conditions.

1. DEFINITIONS:

a) Coal: Coal which falls within different classes/grades of coal as defined in Grade/Price notification issued by Government of India from time to time.

b) Slack:
Coal passing through screen with 200 mm x 200 mm aperatu with no oversize.

c) Lumpy coal:
Coal pieces which are retained on screen with 200 mm x 200 mm aperatures shall be lumpy coal.

Clarification:

In respect of price of coal, definition given in the price notification by Government of India shall prevail.

PERIOD OF CONTRACT :

This contract shall remain in force for a period of one year with effect from 1st July 1985 from which date it shall be deemed to have taken effect and at the expiry of the period, without prejudice to the rights and liabilities of the parties which may have arisen or accrued during the period of subsistance of this contract, this contract will be determined unless renewed/or modified by mutual agreement. In the absence of any notice of termination from either side it shall be deemed that the contract remains in force.

3. QUANTITY & QUALITY :

3.1. QUANTITY :

3.1.1. The Supplier shall supply and the Purchaser shall take coal in quantities in accordance with the quarterly / annual linkage provided by Standing Linkage Committee and materialisation of rail movement which include allotment and placement of rail wagons into the colliery siding for loading.

3.1.2. Sources of supply to the different Power House of the Purchaser shall be settled by mutual discussion between the supplier and the Purchaser from time to time subject to the linkage approved by the Standing Linkage Committee of the Government of India and ovement by Railways. Effort should be made x to supply coal from ollieries having mechanical crushing/screening arrangement.

.2 QUALITY :

.2.1. The Supplier shall take reasonable steps to ensure that ickable shales/stones are removed and no lumpy coal is supplied nd that the quality of coal shall fall within the parameters ndicated in the schedule. In case the oversized coal exceeds 5.0% urchaser will give notice to the Supplier about oversize and if iere is no improvement within one month then deduction will be made t the rate of Rs. 3.00 per M.T. (from slack price) for the quantity ceeding 5.0%. The supply of the day would be assessed on joint rification basis by both parties. In case there is no improvement e source will be delinked.

2.2. If the quality, as determined on the basis of provisions Clause - 6 herein, falls beyond the limitations as specified in e Schedule, the Purchaser shall bring the same to the notice of e Seller for taking appropriate action for improvement.

2.3. If despite notice, the quality of coal supply does not prove, the Purchaser will serve another notice on the Supplier to op supplies from the collieries/sources. After the expiry of 15 d purchaser shall have the right not to accept that coal.

4. FREIGHT

4.1 The wagons shall be booked on RREIGHT TO PAY / FREIGHT PAID basis and by the route as may be declared by the Railways at the time of despatch. In either case payment of freight will be paid by MPEB directly to the Railways.

5. WEIGHT OF COAL

5.1 If coal is despatched by Rail, all the coal wagons load for power station would invariably be weighed at the weigh-bridge Railways/colliery/coalfield and stamped and actual weight recorde in the RRs. Purchaser has the right to witness the weight of wag at weighbridges.

5.2 Wherever, the wagons are not weighed for any reason, the coal wagons shall be loaded upto the loading line determined join by the supplier and purchaser for specific mine, in relation to th carrying capacity of the wagon specified by the Railways.

5.3 The weight mentioned in the RR and the stipulations vide para 5.7 hereunder shall interalia, govern the payment computed fo coal supply.

5.4 In the case of Railways Receipt marked 'said to contain' the quantity aspect of coal as determined by applying the jointly agreed weight to volume conversion factor shall also govern the co price computation. Volume of coal contained in such wagons shall b determined based on the height data as recorded vide clause 5.1 abo To facilitate such weight computation the Seller shall enclose a co of the relevant height measurement data alongwith the respective R

5.5 Weight to volume conversion factor would be jointly determined and reviewed once in six months at the various collieries supplying coal to the Thermal Power Stations.

5.6 The coal companies shall despatch coal in full rake loads to power station on freight to pay/freight paid basis and will comply with all documentation formalities laid down by Railways to ensure that freight is charged by Railways at train load rates only. Any failure in this regard resulting in payment of higher freight charges will be to the Sellers account.

5.7 In case of weighed wagons, loss to the purchaser due to payment of idle freight to the Railways resulting from underloading of wagons below the carrying capacity (as distinct from chargeable weight) and any loss to the purchaser due to the payment of penal freight to the Railways resulting from overloading of wagons shall deducted from

5.8 If coal is despatched by Road/trucks, the weight recorded at the weighbridges at the colliery end shall determine the weight of coal supplies. The purchaser, may, however, depute his representative to witness the weighment.

5.9 If coal is supplied by belt conveyor, a weightometer shall be installed at the colliery/washery~~and~~ end after primary crusher as close to colliery end as possible, and weight recorded by the weightometer shall be deemed to be the weight of coal supplied. weightometer shall be kept under joint seal and will be repaired recalibrated in the presence of the representatives of both the parties, whenever necessary.

5.10 Supplies shall be made on F.O.R. Colliery siding basis for which the coal sales prices are notified by the Government fr time to time. However, where there are pithead colliery siding, the pithead supplies shall be treated as F.O.R. colliery siding basis but where mines are located at long distance from Rly. Siding the cost of handling, loading, carriage/transportation from pithead and loading into wagons at Rly. Siding shall be borne by the Purchaser and would be paid by the Purchaser to the Supplier against the claim bills preferred indicating such charges. However, such charge are mutually agreed.

6. SAMPLING OF COAL AND ANALYSIS :

6.1 In case of supplies of coal to Thermal Power Stations drawing supplies by rail, sampling and analysis shall be undertaken for determining the quality of coal supplied at power station end after the crusher.

6.1.1. Sampling and analysis at power station end in terms of this agreement shall be carried out as per I.S.I. specifications.

6.1.2. Provisional billing will be as per declared grade subject to subsequent cost adjustments being made on joint sampling results at power station end after the crusher.

6.1.3. The joint sampling and analysis conducted at the power station and shall determine the quality of coal supplied. The weighted average of the results of the joint sampling in each month at the power station end shall be the basis for determining the quality and final payment to the Coal Company as per sliding scale. (Graph attached).

6.1.4 Supplier as well as Purchaser shall provide all reasonabl facilities, to be agreed by both parties to this Contract to each of their representatives for implementation of Sampling and Analysi in terms of aforesaid clauses of this agreement.

6.1.5. Joint sampling and analysis shall be done at the power station end after the crusher, three samples shall be collected on random basis at a pre-determined fixed hourly basis, every 24 hrs., from the chute/conveyor after the crusher as per mutually agreed joint sampling protocol.

6.1.6. The samples collected as aforesaid shall be analysed by (1) Purchaser (2) Supplier and the third sample would be kept as a referee sample at the power station end duly sealed by both the part

6.1.7. In the event of a variation between the two results beyond the permissible limits as per ISI Standard the referee sample would be jointly analysed in the presence of Supplier/Purchaser alternatel at the colliery laboratory/power station laboratory whose decision shall be binding on both the Purchaser and Supplier.

6.1.8. In case variation between the declared grade of coal of colliery and the grade determined on the basis of final sampling and analysis was consistently observed for a period of six months Coal Controller shall be approached for the regradation of coal of that Colliery.

6.1.9. The sampling of coal would be carried out jointly at the power station end either by automatic mechanical sampler/equipment or by a manual method as agreed between the parties to this contract.

6.2 JOINT SAMPLING AND ANALYSIS OF COAL OF DIVERTED WAGONS:

6.2.1. Samples would be taken at the Power Station end at the pre-fixed block on hourly basis when diverted rakes are received at the Power Stations. It will, however, not be used for purpose of working the weighted average calorific value of coal supplied for the month.

6.3 JOINT SAMPLING AND ANALYSIS OF COAL SUPPLIED BY MEANS OF TRANSPORT OTHER THAN RAIL.

6.3.1. The venue of joint sampling and analysis of coal shall be at the power station end after crusher for determining the quality of coal as per mutually agreed joint sampling protocol.

7. PRICE OF COAL.

7.1. The price of coal shall be notified by the Government of India from time to time for the quality of coal supplied to the Purchaser and will be regulated as per sliding scale(Graph attached).

In regard to supplies of coal below 1900 Kcal/kg UHV the rate of penalty per 100 Kcal/kg would be at the same rate as bonus from 2000 Kcal/kg UHV to 2400 Kcal/kg UHV on the same principle as per the existing arrangement.

7.2 The Supplier shall inform the Purchaser of the revised prices as per Govt. Notification, as applicable from time to time and the Purchaser shall pay the revised prices with effect from the date notified by the Govt. of India.

7.3 In the event of decontrol of prices of coal by Govt. of India, the prices and sliding scale shall be settled by mutual negotiations within a period of three months pending which the ruling prices on the date of decontrol shall be paid on adhoc basis subject to subsequent adjustment, if any.

7.4 Royalty, taxes, duties, cesses etc. legally payable to the State Govt./Central Govt. or to any authority/body for supplies/despatches of coal shall be borne by the purchaser and shall be paid on the notified grade from the date from which such royalty, taxes, duties and cesses are made effective by the concerned authority.

Provided that the amount of Sales Tax to be paid by Purchaser shall be computed on the basis of actually received grade of coal.

8.0 BILLING AND PAYMENT:

8.1. The supplier shall raise the bills for each rake on the basis of declared grade subject to subsequent adjustments based on joint sampling results after crusher at the power station end.

8.2. The supplier shall arrange to submit original bills alongwith D/Notes immediately on preparation of these documents either through courier or by registered AD to the nominated office of the Purchaser.

8.3. Such bills shall be paid within 7 days after receipt by the Purchaser.

8.4. In the event of delay in payment the Supplier shall be entitled to ask for interest on the sum remaining outstanding for a period beyond seven days. The interest shall be chargeable from the 8th day onwards after the receipt of bills at Purchaser's Office at the rate of interest paid by the Supplier on cash credit with State Bank of India.

In the event of continued failure on the part of Purchaser in making timely payments of suppliers bills, supplier will have option to stop/suspend supplies of coal after giving a notice of one month to the Purchaser.

8.5 For the purpose of final payment to the Coal Companies the weighted average of the results ofthe joint sampling in each month at the Power Station end would be the basis. The weighted average would be restricted to the coal consignments which are originally booked to the Purchaser's power station and would not include the analysis results of coal received in diverted rakes, bills for which must be raised subsequently on the request of the Railways or the original consignee for regularisation of the account on determining the weighted average of the results, the debit or credit notes, as may be applicable, depending upon the joint analysis of coal actually received during the previous month, would be sent by the Purchaser to the Supplier and the Supplier would adjust the debit or credit notes in the bills raised by him within a week of the receipt of such notes.

8.6. In case the supplies pertain to inter-state transaction, Central Sales Tax at the present rate of 8% is leviable over and above the price of coal. But if the purchaser desires to avail of the concessional rate of Sales Tax at the rate of 4%, they would have to send Central Sales Tax declaration forms to the Supplying Colliery immediately (not later than 15 days) on receipt of a copy of the bill. The collieries would be advised to prefer bill at the rate of 4% Sales Tax subject to receipt of Sales Tax declaration forms within the specified date noted above. But the colliery would be entitled to claim payment of the additional sales tax of 4% in the event of non-receipt of Sales Tax Declaration form from the Purchaser within the stipulated date as stated above.

8.7. Missing wagons/diverted wagons/missing rakes/diverted rakes/pilferage or any subsequent losses after loading from the colliery, shall be at the risk and liability of the Purchaser. The purchaser will not have any claim from the Supplier against such incidences of loss and will not withhold any payment to the supplier.

9.0. ADJUSTMENT IN PRICE BASED ON THE ACTUAL USEFUL HEAT VALUE:

9.1. For adjustment of price payable for coal received during a month, the actual grade of coal shall be determined on the basis of monthly weighted average useful heat value as indicated in the joint sample at the power station end after the Crusher.

9.1.1. For purpose of clause 9.1. actual weighted average useful heat value as per joint sampling as determined under Clause 6 shall be rounded off to the nearest 50 K.Cal/Kg. as per ISI.

9.1.2. The adjustment price determined as per clause 9.1. and 9.1.1. above shall be applicable for the quantity of coal despatched and sampled as per protocol to which the weighted average useful heat value actually relates.

9.1.3. Other charges viz Royalty, Cesses, as applicable for the grade of coal notified shall be payable by the Purchasers as provided in para 7.4.

10. ADJUSTMENTS OF PAYMENTS:

In case the RR in original in respect of which the payment is already made by the Purchaser as provided in Clause 8 above is not received at the destination within ten days of the payment of the bill Purchaser shall request the colliery concerned to send copy of R/R. If the copy of the R/R is not made available within 15 days of the receipt of such request, the consignee will raise Debit Notes in Quadruplicate, interalia, indicating therein reference to original bill number, wagon number, R/r number and the cost of coal paid against the R.R. material not received. The Debit note as raised shall be settled by the supplier within a fortnight of its receipt. If the D/Note is not settled within 15 days, the Purchaser shall deduct the amount from future bills. If the supplier furnishes original R.R. or any other documents acceptable to the Railways for the purpose of lodging the claim with Railways, the D/Notes raised by the Purchaser shall be returned by the Supplier to the Purchaser alongwith R.R. or any other documents stated above. No D/Note, however, shall be raised due to non-receipt of R.R. by the Purchaser, if delivery of wagon is received by the purchaser without presentation of R/R.

10.1. For the purposes of adjustment of price on the basis of joint sampling the power house shall forward D/Notes in quadruplicate after computation of weighted average results for the period alongwith relevant data of analysis results in support of ~~such~~ their claim to the relevant Area Office of the Supplier. A copy of such D/Notes and such details in duplicate will also be forwarded to the Sales Office of the Supplier at Nagpur/Calcutta. The format for furnishing the details shall be evolved jointly.

10.2. The D/Notes will be processed by the supplier and corresponding Credit Notes will be issued to the Power Houses concerned within 7 days from the receipt of the Notes.

10.3. Amount advised through Credit Notes will be adjusted against the current payments by the Purchaser who shall furnish to the Supplier necessary particulars thereof alongwith the advice of payment.

10.4. Supplementary payment arising from adjustment in price based on the results of analysis of samples referred to in clause 6 shall be made by the Purchaser within 15 days of the weighted average analysis results. For regularisation of the account, the supplier will issue supplementary bills within a fortnight after receipt of such details.

10.5. If any dispute arises on settlement of such D/Notes, a quarterly meeting will be arranged between the parties to this agreement at a convenient venue to settle the cases which pertain to the earlier quarter . Decision taken during these meetings will be binding on both the parties.

10.6. Adjustment of sample results will be restricted to the coal consignment which are originally booked to the purchaser's power houses and would exclude the analysis of diverted rakes of coal received bills for which must be raised subsequently on the request of the railways or the consignee for regularisation to the account.

11. FORCE MAJEURE:

In this context, 'Force Majeure' shall be deemed to mean any clause beyond the reasonable control of the Sellter or Purchaser, as the case may be, which prevents due performance of the contract and which by due diligence the affected party is unable to avoid or overcome by its individual effort. 'Force Majeure' shall include, but shall not be limited to the following matters:-

a) Any riot or civil commotion.
b) Any war or hostilities.
c) Any earthquake, flood, tompest, lighting or other natural and physical disaster.
d) Any accident by fire or explosion, plant & Machinery break-down etc.
e) Any strike or lock out or other industrial disturbances affecting the performance of the contractual obligations
f) Any law or order, proclamation regulation, ordinance of Govt. or Sub-Division thereof.
g) Non-availability or irregular supply of wagons.

If either party is prevented ~~supply of wagons~~ or inordinatel delayed in the performance of any of its obligation, under the Contrac by Force Majeure and if the affected party gives written notice thereof to the other party specifying the matter constituting Force Majeure that a contractual obligation is thereby prevented or delayed and the further period for which it is estimated that such prevention or delay will continue, then the affected party shall be excused for the performance or delayed performance as the case may be of such delay as from the date of such notice for so long as may be justified.

12. ARBITRATION:

In the event of any dispute of difference between the parties hereto, such dispute or difference shall be resolved amicably by mutual consultation or through the good offices of empowered agencies of the Government. If such resolution is not possible, then, the unresolved dispute or difference shall be referred to arbitration of an arbitrator to be nominated by Secretary, Department of Legal Affairs (Law Secretary) in terms of Office Memorandum No. 55/3/1/75-OF, dated the 19th Dec, 1975 issued by the Cabinet Secretariat (Department of Cabinet Affairs), as modified from time to time. The Arbitration Act 1940 (10 of 1940) shall not be applicable to the arbitration under this clause. The award of the arbitrator shall be binding upon parties to the dispute. Provided, however, any party aggrieved by such award may make a further preference for settling aside or revision of the award to Law Secretary whose decision shall bind the parties finally and conclusively.

13. MODIFICATION OR TERMINATION OF CONTRACT:

13.1. The terms and conditions of this Contract may be modified by mutual agreement.

IN WITNESS WHEREOF THE PARTIES TO THIS CONTRACT HAVE hereunto subscribed their names and signatures on the date hereinafter mentioned respectively.

T.V.

(T.V. LAKSHMANAN)
Chairman Cum Managing Director
Western Coalfields Limited

(T.K. SRINIVASAN)
Chairman
M.P. Electricity Board

Witness:

15/5/85

1. K.G. Rawal
General Manager (Marketting)

15/5/85

2. B.N. Prasad
General Manager (Quality Control)

Witness:

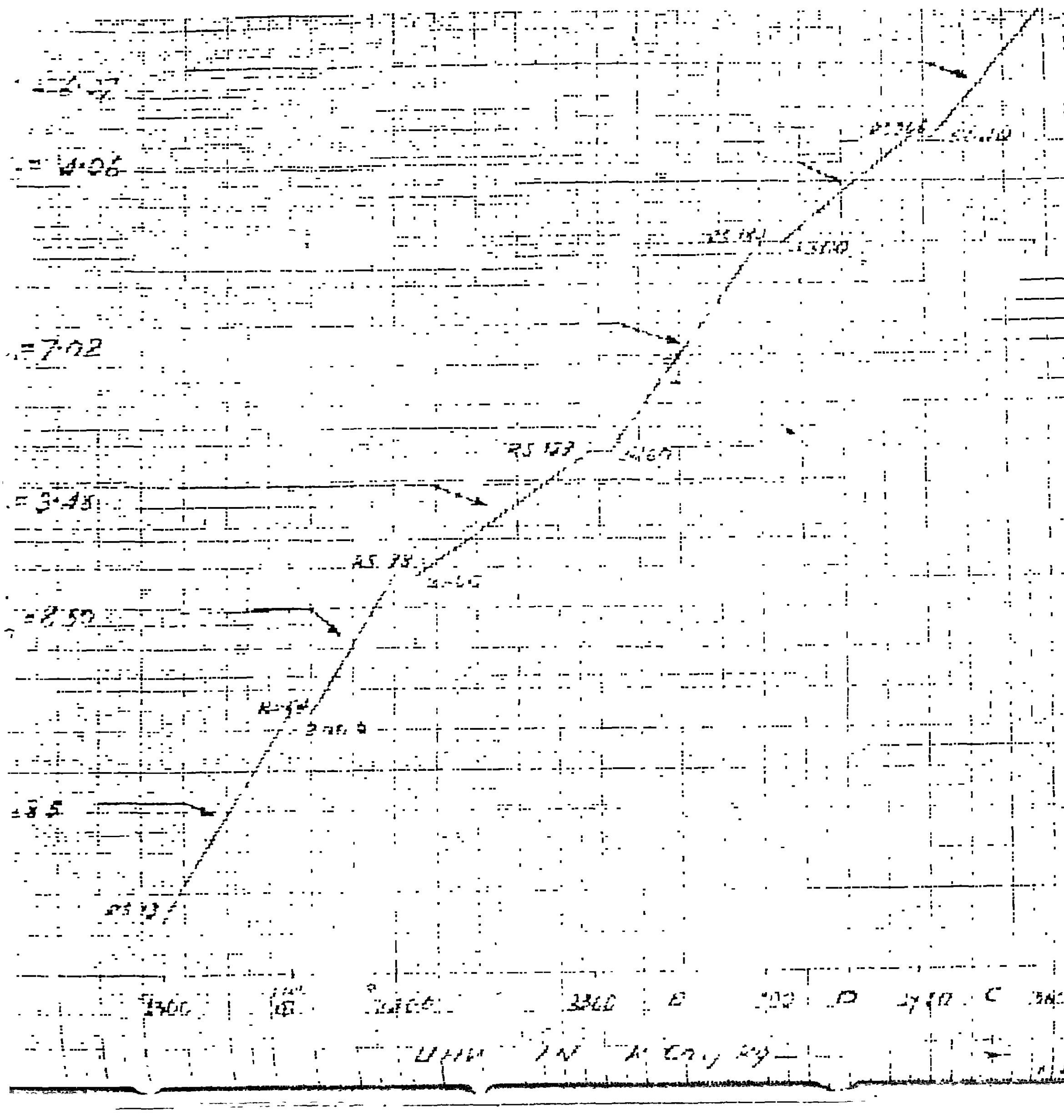
15/5/85

1. S. Jandial
Chief Engineer (O&M-Gen)

15/5/85

2. T. Lalwani
Superintending Engineer
(O & M-Gen)

SLIDING SCALE FOR PAYMENT



NOTE: IN RESPECT OF SUPPLIES OF COAL BELOW 1300 UHV THE RATE OF PENALTY FOR THE SLIDING SCALE WOULD BE AT THE SAME RATE AS BONUS FROM 2000 [illegible] TO 2400 UHV ON THE SAME PRINCIPLE AS PER THE EXISTING ARRANGEMENT

PRICE STRUCTURE OF COAL [illegible]

S.No	GRADE	U.H.V RANGE	PRICE OF SLACK [illegible]
1	A	EXCEEDING 6200	2[illegible]
2	B	5600 - 6200	240
3	C	4940 - 5600	206
4	D	4200 - 4940	180
5	E	3360 - 4200	128
6	F	2400 - 3360	[illegible]
7	G	1300 - 2400	[illegible]

AS MUTUALLY AGREED ON [illegible]

15/5/85 13/5 13/5/85 15/5

SCHEDULE

S.No.	Particulars	Korba-I	Korba-II	Korba III	Korba West	Ank.I	Ank.II	BTP-I	STP II	STP III
1.1.	The coal supplied shall have the following characteristics:									
1.1.1	The coal should be Grade or equivalent as per specification mentioned hereunder.	(E+F)	F	F	F	D	E	F	F	F
1.1.2	(a) The Gross Calorific value (on air basis as per ISI) shall be Kcal/kg.	4660	3935	3935	3935	5295	4660	3935	3935	3935
	(b) Useful heat value will be K.cal/Kg.	3460	2500	2500	2500	4300	3460	2500	2500	2500
1.1.3	The ash content (on air dry basis) shall not be more than %	34 to 36	40 to 42	40 to 42	40 to 42	28 to 30	34 to 36	40 to 42	40 to 42	40 to 42
1.1.4	The moisture content(on air dry basis) shall not be more than % @ 60% RH & 40°C.	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5
1.1.5.	The ash + moisture content (on dry basis) shall not be more than %	39	46	46	46	33	39	46	46	46
1.1.6	Total moisture content(on received basis) shall not be more than %	5.5	12	12	5.8 12	10	11	9	5.5	5.5
1.1.7	The sulpher content shall be less than %	1	1	1	1	1	1	1	1	1
1.1.8	The volatile content of coal shall not be less than %	20	20	20	20	20	20	20	20	20
1.1.9.	The initial deformation/ash fusion temp. shall not be less than °C.	1150/1350	1150/1350	1150/1350	1150/1350	1150/1350	1150/1350	1150/1350	1150/1350	[illegible]
1.1.10	The hard grove(Grindability Index) shall not be less than.	50	50	50	50	50	50	50		
1.1.11	The find dust content of coal at specific gravity 1.8 shall not be more than %	5	5	5	5	5	5	5		
1.1.12	Supplies shall be either freshly mine coal or from slack coal stack of less than storage as far as possible.	30 days	30 days	30 days	30 days	30 days	30 days	30 days		

MCL will make all out efforts to ensure that the quality supplied as in the past is not only maintained but also improve upon it wherever possible.

CHAPTER 4

Coal pricing

Current procedure for coal pricing

The nationalization of coal mines was done in two phases between 1971 and 1973. Since then, coal prices have been regulated and revised several times on the basis of the suggestions of Committees and Working Groups set up by the Government. In general, all the committees have advocated that the pit-head price of coal should be related to the industry-wide average cost of production with suitable allowance made for cost increases. Starting with the Fernandes Committee in 1973 right upto the price revision exercise presently completed by the Bureau of Industrial Costs and Prices (BICP)[1], a principle of 'cost plus' has been adopted for coal price fixation. The average cost of production is estimated for a sample of representative mines. The pit-head price of coal is presently based on the average cost of production for the industry, differentiated between grades of coal depending upon properties such as ash content or useful heat value (UHV). The pricing procedure focuses only on the pit-head or the mine head price with the delivered price of coal left largely uncontrolled. The delivered price of coal to the consumer is determined by adding transportation costs, taxes, royalty payments and local cesses to the pit-head price. Due to geographical concentration of coalfields in the eastern part of India, coal is transported over long distances. Hence, the share of transportation costs in the delivered price is quite high.

The present structure of coal pricing is not quite rational in the following respects.

- The pit-head prices, which are related to the cost of production, have an in-built inefficiency in that these are calculated without any consideration for productivity.
- In the post-nationalization period the remuneration paid to coal workers has risen faster than labour productivity and, in fact, even higher than the overall escalation in the cost of coal production.
- There is a glaring discrepancy observed in the present price structure of non-coking coal, whereby some of the inferior grades of coal are priced higher per unit of useful heat value as compared to the superior grades of coal.
- There is no systematic or logical principle adopted for inter-grade price differentials.
- The wide range of useful heat value in the lower grades has encouraged supply of coal with UHV at the lowest of the range.

---

[1] BICP has been involved with coal price fixation since the early 1980's.

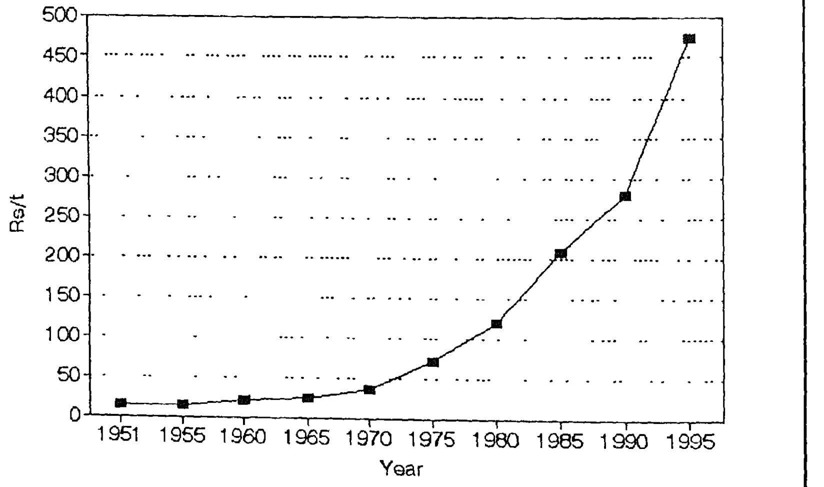
Trend in coal prices

The behaviour of coal prices can be broadly categorized into two phases in time (Figure 4.1).

- The pre-nationalization period when coal prices remained fairly low and increases in them were steady. The prices increased at a growth rate of 3.5% during the 1950s and 5.6% during the 1960s.
- The post-nationalization period which witnessed a sharp rise in prices, registering an annual rate of increase of 12.8% during 1970-80 and 9.7% during 1980-95.

The rapid escalations in the post-nationalization period are often attributed to factors such as the absorption of casual workers in the regular labour force leading to a higher wage bill, improvement in the bargaining power of labour due to unionization, delinking of wage and labour productivity, increasing capital intensity of new mines and increasingly difficult geo-mining conditions leading to higher costs of production. In terms of relative prices of different grades, the revisions affected during the period 1979-85 had enhanced the differential between coking coal and superior non-coking coal and superior and inferior non-coking coals. The intent was to avoid a sub-optimal use of good quality coal and encourage producers to improve the output mix. However, the subsequent price revisions made since January 1986 till date have narrowed the inter-grade price differentials.

Fig 4.1 Trend in the average price of coal at pit-head (Rs./t)



Administered price of non-coking coal at the pit-head

The administered price of coal was last revised on June 16, 1994 and details of the government notification are given in Annexure 4.1. The summarized price of different grades of non-coking coal are given in Table 4.1.

Table 4.1. Administered price of non-coking coal at pit-head

Grade of coal	Useful heat value in kCal/kg	Sale price per tonne of (Rs.)		
		Steam coal and rubble	Slack coal and washery middlings	Run of mine coal
Coal (other than long flame coal) produced in all States except in the States of Assam, Arunachal Pradesh, Meghalaya, Nagaland and Andhra Pradesh				
Grade A	Exceeding 6200	652	645	642
Grade B	Exceeding 5600 but not exceeding 6200	596	589	586
Grade C	Exceeding 4940 but not exceeding 5600	523	516	513
Grade D	Exceeding 4200 but not exceeding 4940	416	409	406
Grade E	Exceeding 3360 but not exceeding 4200	332	325	322
Grade F	Exceeding 2400 but not exceeding 3360	267	260	257
Grade G	Exceeding 1300 but not exceeding 2400	193	186	183

The useful heat value is defined by the following formula:

$$\text{UHV} = 8900 - 138\,(A + M)$$

$$(A = \text{Ash }\%;\ M = \text{Moisture }\%)$$

are determined at standard conditions of 60% relative humidity and 40 °C temperature.

Additional points

- Certain coals in these coalfield have been defined as long flame coals and they are charged Rs. 25/- tonne over the prices given in Table 4.1. These coals have higher volatile matter content.
- A premium of 10% over the notified prices is charged on coals of grades A, B, C and D supplied from selected collieries.
- The coals produced in the states of Assam, Arunachal Pradesh, Meghalaya and Nagaland are priced at Rs. 751/- per tonne (ash content not exceeding 25%).
- Coals produced in Singareni Coalfield (Andhra Pradesh) are charged Rs. 122/- to Rs. 147/- per tonne over the prices given in Table 4.1, depending on the grade (Grade C to G).
- The prices notified are applicable to sale of coal at pit-heads on FOR colliery siding basis.

Coal price and demand

TERI carried out a study on the impact of price increase on coal demand for the power and steel sectors, since these two sectors account for about (80-85%) of coal consumed in the country. The consumption of power and steel grade coals was analyzed in relation to the average pit-head price. In case of non-coking coal, the price was a weighted average of the pit-head price of grades D, E, F and G which are predominantly used for power generation. In case of coking coal it was the average pit-head price of the washery grades I, II, III and IV. The time series data on coal consumption along with the average prices are shown graphically in Figures 4.2 and 4.3.

The demand for both power and steel grade coals has been in excess of their domestic supply which has resulted in a less than full demand satisfaction in case of the former and rising imports of coking coal for the steel industry. An unsaturated demand will not be responsive to price changes. This was also supported by the trend in demand and price of coal. In general, the coking coal demand and its price have depicted a rising trend in the last decade, with the rate of price increase of both being almost the same in the period 1980-81 to 1983-84. This was followed by a period of stagnation in its consumption at about 25 Mt between 1983-84 to 1985-86 while the price registered a steep increase. Thereafter, both demand and price rose at the same rate upto 1988-89, after this the slope of the price line became steeper than that of the consumption line implying sharply rising prices. Similarly, in case of power grade coal both demand and price delineate a rising trend with the absence of an inverse relationship in any of the time periods under study. Quite unambiguously, the conventional demand-price relationship does not hold for both coking and non-coking coal.

Market price

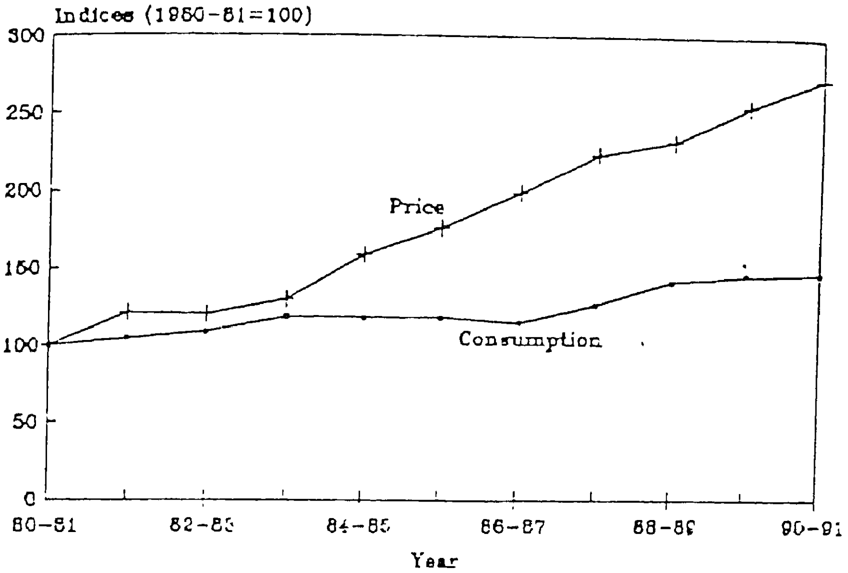
The government administers the pit-head price of coal while leaving the price paid by the consumers largely unregulated. Thus, to arrive at the delivered market price of coal is added the loading/transport charges at the pit-head, processing charge, royalty, cess, duties and taxes and the transportation and handling costs from the colliery to the consumer. Figure 4.4 depicts the components of coal price at the consumer end. The details of the various charges are as follows.

Transportation charges at pit-head

Where coal is transported beyond a distance of 3 km to the loading point, the coal companies shall be entitled to charge additional transport costs from the purchasers at following rates.

- Distance more than 3 km but not more than 10 km Rs. 18/- per tonne.
- Distance more than 10 km but not more than 20 km Rs. 35/- per tonne.

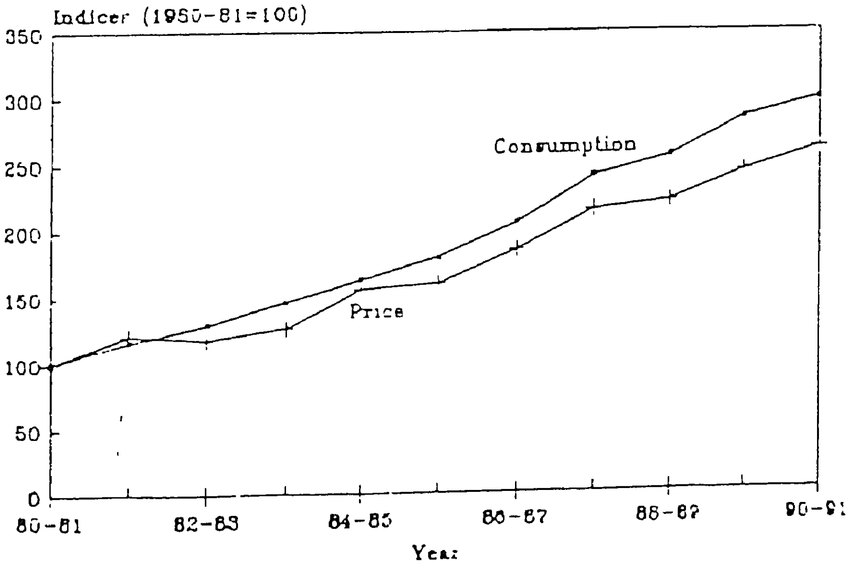
Figure 4.2. Trend in coking coal demand and price (steel industry)



Price refers to the average pithead price

1980-81: Base price = Rs.137/t
Consumption = 21.01 Mt

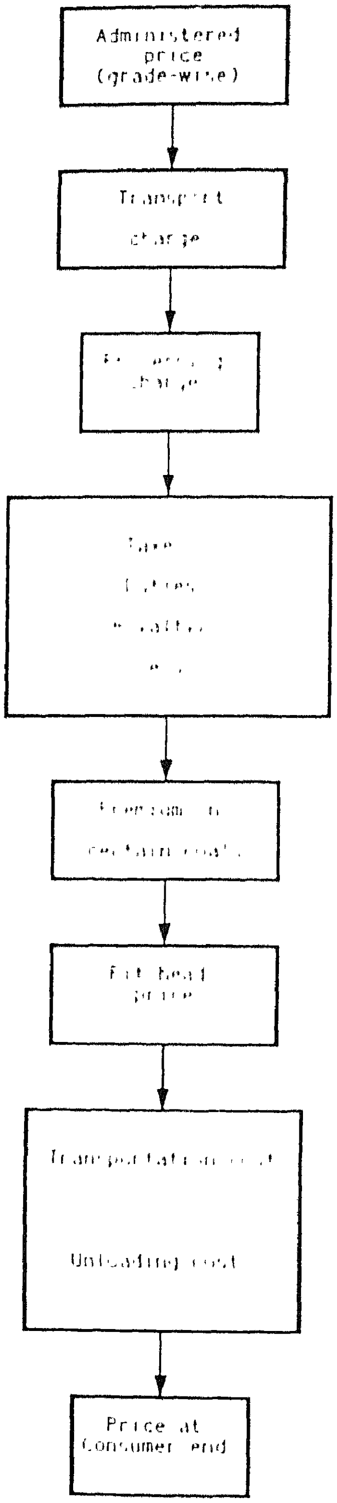
Figure 4.3. Trend in non-coking coal demand and price (power sector)



Price refers to the average pithead price

1980-81: Base price = Rs.86/t
Consumption = 38.15 Mt

Fig 4.4 Coal price at consumer end



Royalty

The Central Government has revised the rates of royalty on coal w.e.f. 11.10.1994. The enhancement of rates has been made keeping in view the interests of both the consumers and the coal producing States and at the same time ensuring the development of coal mining industry. The royalty on coal production is collected by the concerned state governments. The revised rates are given in Table 4.2.

Table 4.2. Revised rates of royalty on coal (Rs. per tonne)

Coal group	Royalty w.e.f. 1.8.91	Royalty w.e.f. 11.10.94	Percentage of average price/ton
Group I (Coking SG I, II, WG I)	150	195	24
Group II (Coking Coal WG II, III, SC I, II, Non-Coking A, B)	120	135	24
Group III (Coking Coal WG IV, Non-Coking C)	75	95	20
Group IV (Non-Coking D, E)	45	70	20
Group V (Non-Coking F, G)	25	50	20
Group IV (Coal produced in Andhra Pradesh)	70	75	15

Cess, duties and taxes

Cess

The revised royalty rates were accepted by all the state governments except West Bengal and Assam. After the revision of the royalty rates, the cess on coal has been abolished. However, the states of West Bengal and Assam continue to levy cess on coal and this matter is pending in the court for settlement.

Duties

A uniform charge of Rs. 3.50 per tonne is levied on coal price as stowing excise duty.

Taxes

Central Sales Tax is levied on the price of coal at the pit-head at a uniform rate of 4% if the coal is transported outside the state where it is produced. If the coal is consumed in the same state where it is produced, the sales tax at a rate of 9% is levied on the price of coal.

Transportation cost from colliery to consumer end

The rail tariff per tonne km for coal movement in train roads gradually decreases from Re. 0.74/- per tkm for a haul of 100 km to Re. 0.54/- per tkm for a haul of 1300 km. Figure 4.5 depicts the rail tariff (since April 1995) for coal movement per tkm over some selected distances. The average lead for coal movement by rail is about 700 km and the tariff per tkm is Re. 0.55/- in 1995. The rail tariff per tkm has been increasing regularly over the years. Figure 4.6 depicts the average freight per tkm for all commodities from 1950-94.

The delivered price of grade F coal for selected distances has been estimated and is given in Table 4.3. It can be seen from the table that the transportation charges is a major component in the delivered price of coal. The share of transportation charge in the delivered price of coal increases from 27% for a 200 km haul to 68% for a 1300 km haul and becomes 75% for a 2000 km haul (for consumers in west and south).

Table 4.3. Delivered price of grade F coal for selected distances (Rs./tonne)

Components	200 km	500 km	1000 km	1300 km	2000 km
Administered price	264.2	264.2	264.2	264.2	264.2
Transport charges	-	-	-	-	-
Royalty	50.0	50.0	50.0	50.0	50.0
Cess	-	-	-	-	-
Duties	3.5	3.5	3.5	3.5	3.5
Taxes (4%)	12.7	12.7	12.7	12.7	12.7
Pit-head price	330.4	330.4	330.4	330.4	330.4
Rail transport	124.0	279.0	551.0	699.0	981.0
Price at consumer end	454.4	609.4	881.4	1029.4	1311.4

Note: Excludes States of West Bengal and Assam.

Fig 4.5 Rail freight for coal movement

April 1995

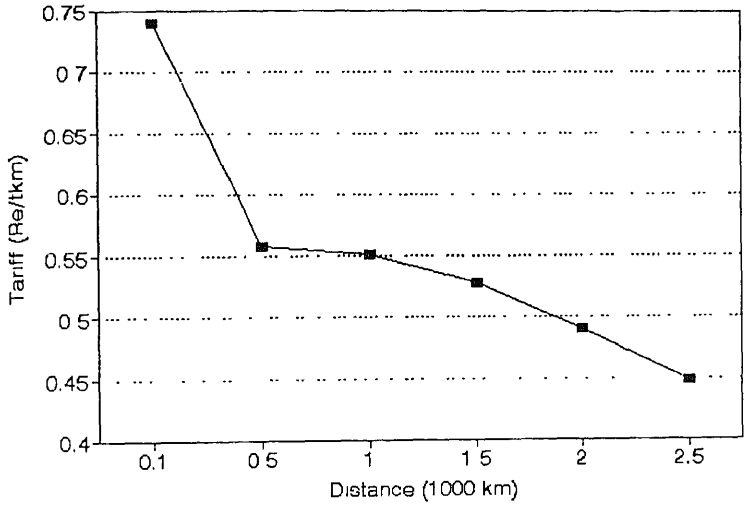
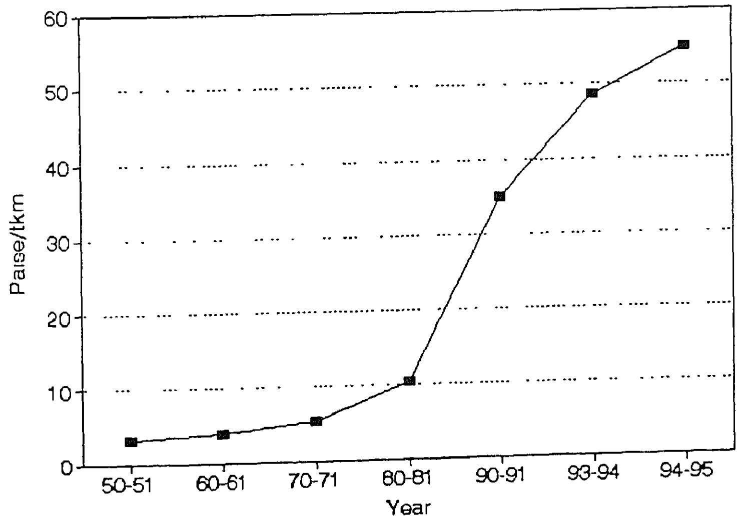


Fig 4.6 Average freight rate per tkm

All commodities



Imported coal

The demand of washed coking coal for the steel plants in recent years is far outstripping the indigenous supply both in terms of quality and quantity. The existing washeries are old and are unable to meet the demand in terms of quality of supplies (< 17.5% ash content in coal). Therefore, 6-7 Mt of low ash coking coal is being imported annually by the steel plants for meeting their demand. As a special case, the Government has imposed a duty of only 5% on the imports of coking coal by the steel industry. Recently, the Government of India has announced a reduction of import duty on non-coking coal from the existing level of 85% to 35% of CIF value. As a result there is a general apprehension that thermal power stations and other industrial units located in the coastal belts of Tamil Nadu, Karnataka and Gujarat may resort to import of the non-coking coal. The main reasons are that the imported coal would be superior in quality and may be cheaper in price, besides assured regular supply.

Coking coal for steel sector

Since the existing coking coal washeries are unable to meet the demand of the steel sector in terms of quality and quantity, 7-8 Mt of low ash coking coal is being imported annually and this would increase in the future.

Non-coking coal for industries

Import of non-coking coal may become competitive to location specific industries on account of reduction in customs duty from 85% to 35%. The industries that are likely to import good quality non-coking coal are cement, heavy chemical (caustic soda) and sponge iron units. It is estimated that about 0.5 Mt of non-coking coal was imported during 1994-95.

Non-coking coal for coastal power stations

The coastal power stations may import coal due to the heavy transportation charges in the delivered price of coal. An exercise was carried out to assess the coal demand of thermal power stations located at or near the coast. The coal demand increases from an estimated 29.5 Mt in 1994-95 to 48.5 Mt in 2001-02. Out of 48.5 demand in 2001-02, approximately 21 Mt is for new power plants. So far as the movement of this coal is concerned, about 50% of the demand is estimated to be moved through rail cum sea route in 1994-95 and this increases to 62% in 2001-02. This requires rapid development of ports near the consuming power stations. The balance quantity of demand is projected to be moved by all rail route.

Delivered price of imported steam coal at Madras port

Steam coal prices have been through a number of cycles over the 15 year period (1980-95): price rose sharply in the early 1980's, declined in the mid 1980's, rallied, declined again before raising in the late 1980's and before falling steadily to 1994. In 1995, there is a sharp turn-around in the prices following the out come of price negotiations for deliveries in 1995 - of the order of 20% for steam coal over 1994 prices. As per information available the FOB price of steam coal in 1995 at Australian port is US $ 40.3/t and at South African port is US $ 32.9/t. The 1994 prices were US $ 34.35/t (Australia) and US $ 24.5/t (South Africa). The average CIF price at Madras port is taken as US $ 50/t. The imported coal would have an average gross calorific value of 6,500 kCal/kg. The landed cost of imported coal per tonne at Madras port would be as follows:

CIF value	=	US $ 50
Import duty @ 35%	=	US $ 17.5
Therefore total CIF value	=	US $ 67.5
(US $ 1 = Rs. 34/-)	=	Rs. 2,295
Port charges	=	Rs. 157
Total	=	Rs. 2,452

Delivered price of indigenous coal at Madras port

Table 4.4 indicates the landed cost of coal at Madras and Tuticorin ports.

Table 4.4. Landed cost of coal ('F' grade) at Madras port (Rs. per tonne)

Source	Pit-head price	Rail freight	Loading port	Discharge port	Loading port charges	Sea freight	Discharge port charges	Total
Talcher	330	120	PDP	MAS	229	160	157	996
Ib valley	330	275	VZA	MAS	173	147	157	1082

Note: PDP - Paradip, VZA - Vishakapatnam, MAS - Madras.

Comparison of indigenous and imported coal prices

It is assumed that the indigenous coal from Talcher and Ib valley coalfields would be 'F' grade coal with a gross calorific value of 3,600 kCal/kg. Therefore, for every tonne of imported coal, 1.8 tonne of indigenous coal would be required for consumption. Taking this factor of 1.8 the delivered price of indigenous coal at Madras port would be Rs. 1,793/- for Talcher coal and Rs. 1948/- for Ib valley coal. Therefore, it can be concluded that with the present price of imported steam coal the indigenous coal is cheaper.

Comparison of washed coal and imported coal prices

The delivered price of washed coal from Talcher at Madras port would be as follows:

(Figures in Rs/t)

	Process cost at Rs. 150/t		Process cost at Rs. 100/t	
	80% yield	70% yield	80% yield	70% yield
Washed coal price at pit-head	661	755	592	676
Rail freight to Paradip	120	120	120	120
Loading port charges	229	229	229	229
Sea freight	160	160	160	160
Discharge port charges	157	157	157	157
Total	1327	1421	1258	1342
Price of 1.4 tonne of washed coal	1858	1989	1761	1879

Assuming that the washed coal would have a gross calorific value of 4,600 kCal/kg and imported coal 6,500 kCal/kg, 1 tonne of imported coal would replace approximately 1.4 tonnes of washed coal. As can be seen from the table above, the washed coal price at Madras port would be cheaper than the imported coal.

Annexure 4.1.

(TO BE PUBLISHED IN PART II SECTION 3, SUB SECTION (ii), OF THE GAZETTE OF INDIA EXTRAORDINARY, DATED the 16th June, 1994)

GOVERNMENT OF INDIA
MINISTRY OF COAL

NEW DELHI, the 16th June 1994

NOTIFICATION

S.O. 453 (E): In pursuance of clauses 3 and 4 of the Colliery Control Order, 1945 as continued in force by section 16 of the Essential Commodities Act, 1955 (10 of 1955) and in supersession of the notifications of Government of India in the Ministry of Coal number S.O.403(E) dated the 18th June, 1993 and S.O. 281(E) dated the 31st March 1994, except as respects things done or omitted to be done before such supersession, the Central Government on and from the 17th June 1994 hereby prescribes in Table I below the classes and grades into which coal and coke shall be categorized and fixes in Tables II, III, IV, V and VI below the sale prices at which coal or coke may be sold by the colliery owners at pit-heads:

Table I. Categorization of coal and coke

No.	Class	Grade	Grade specification
1	Non-coking coal produced in all states other than Assam, Arunachal Pradesh, Meghalaya and Nagaland	A	Useful heat value exceeding 6200 kCal/kg
		B	Useful heat value exceeding 5600 kCal/kg but not exceeding 6200 kCal/kg
		C	Useful heat value exceeding 4940 kCal/kg but not exceeding 5600 kCal/kg
		D	Useful heat value exceeding 4200 kCal/kg but not exceeding 4940 kCal/kg
		E	Useful heat value exceeding 3360 kCal/kg but not exceeding 4200 kCal/kg
		F	Useful heat value exceeding 2400 kCal/kg but not exceeding 3360 kCal/kg
		G	Useful heat value exceeding 1300 kCal/kg but not exceeding 2400 kCal/kg
2	Non-coking coal produced in the states of Arunachal Pradesh, Assam, Meghalaya and Nagaland		Not graded
3	Coking-coal Steel Grade I		Ash content no exceeding 15%
	Grade II		Ash content no exceeding 15% but not exceeding 18%
	Washery Grade I		Ash content no exceeding 18% but not exceeding 21%
	Washery Grade II		Ash content no exceeding 21% but not exceeding 24%
	Washery Grade III		Ash content no exceeding 24% but not exceeding 28%
	Washery Grade IV		Ash content no exceeding 28% but not exceeding 35%
4	Semi-coking and weakly coking-coals Grade I		Ash plus moisture content not exceeding 19%
	Semi-coking Grade II		Ash plus moisture content not exceeding 19% but not exceeding 24%
5	Hard coke By product premium		Ash content not exceeding 25%
	By product ordinary		Ash content not exceeding 25% but not exceeding 30%
	Beehive premium		Ash content not exceeding 27%
	Beehive superior		Ash content not exceeding 27% but not exceeding 31%
	Beehive ordinary		Ash content not exceeding 31% but not exceeding 36%

Notes:

1. Coking Coals are such coals as have been classified as coking coals by the erstwhile Coal Board under the Coal Mines (Conservation, Safety and Development) Act, 1952 (12 of 1952) (since repealed) or such coals as have been declared or may be declared as coking coal by the Central Government under the Colliery Control Order, 1945 or the Coal Mines (Conservation and Development) Act, 1974 (28 of 1974) and the rules made under both the aforesaid Acts.
2. 'Semi-coking coals' and 'weakly coking coals' are such coals as were classified as 'Blendable coals' by the erstwhile Coal Board under the Coal Mines (Conservation, Safety and Development) Act, 1952 (12 of 1952) (since repealed) or as may be declared as 'semi-coking' or 'weakly coking' coals by the Central Government under the Colliery Control Order, 1945 or the Coal Mines (Conservation and Development) Act 1974 (28 of 1974) and the rules made under both the aforesaid Acts.
3. Coals other than coking or semi-coking or weakly coking coals are non-coking coals.
4. 'Useful heat value' is defined by the following formula

   UHV = 8900-138 X (A plus M)
   where UHV = Useful heat value in kCal/kg
   A = Ash content in percentage
   M = Moisture content in percentage

   In the case of coal having moisture less than 2% and volatile content less than 19% the useful heat value shall be the value arrived as above reduced by 150 kilo calories per kilogram for each one percent reduction in volatile content below 19% fraction pro-rata.

   Both moisture and ash shall be determined after equilibrating at 60% relative humidity and 40 °C temperature as per relevant clauses of Indian Standard Specification No.IS: 1350-1959.
5. Ash percentage of coking coals and hard coke shall be determined after air-drying as per IS: 1350-1959. If the moisture so determined is more than 2%, the determination shall be after equilibrating at 60% relative humidity at 40 °C temperature as per IS:1350-1959.
6. 'Long flame coals' shall be defined by the parameters as laid down in Table II of Indian Standard Specification No. IS: 770-1964, 'General classification of coals (Revised)'. The relevant part is extracted below:

Group	Volatile matter present (unit coal basis)	Range of gross CV in kCal/kg (unit coal basis)	Range of dried Moisture present at 60% RH at 40 °C (Mineral free coal basis)
B4	Over 32	8060 to 8440	3 to 7
B5	Over 32	7500 to 8060	7 to 14

The determination of volatile matter and moisture shall be carried out on coal samples as per procedure laid down in Indian Standard Specification No. IS: 1350 (Part-I) 1984. Determination of gross calorific value shall be carried out in accordance with procedure laid down in IS: 1350 (Part-II) 1970 dated April 1971 or any subsequent revision thereof.

7. The above classification shall not apply to coals other than Bituminous or sub-Bituminous coals as specified under Indian Standard Specification No.IS: 770-1964

Table II. Non-coking coal

Grade of coal	Useful heat value in kCal/kg	Sale price per tonne of (Rs.)		
		Steam coal and rubble	Slack coal and washery middlings	Run of mine coal
1. Long flame coal produced in Collieries in all the States excepting Assam, Arunachal Pradesh, Meghalaya, Nagaland and Singareni collieries in the State of Andhra Pradesh				
Grade A	Exceeding 6200	677	670	667
Grade B	Exceeding 5600 but not exceeding 6200	621	614	611
Grade C	Exceeding 4940 but not exceeding 5600	548	541	538
Grade D	Exceeding 4200 but not exceeding 4940	441	434	431
2. Coal (other than long flame coal) produced in all States except in the States of Assam, Arunachal Pradesh, Meghalaya and Nagaland				
Grade A	Exceeding 6200	652	645	642
Grade B	Exceeding 5600 but not exceeding 6200	596	589	586
Grade C	Exceeding 4940 but not exceeding 5600	523	516	513
Grade D	Exceeding 4200 but not exceeding 4940	416	409	406
Grade E	Exceeding 3360 but not exceeding 4200	332	325	322
Grade F	Exceeding 2400 but not exceeding 3360	267	260	257
Grade G	Exceeding 1300 but not exceeding 2400	193	186	183
3. Coal produced in the State of Andhra Pradesh (Singareni collieries)				
Grade C	Exceeding 4940 but not exceeding 5600	670	663	660
Grade D	Exceeding 4200 but not exceeding 4940	594	587	584
Grade E	Exceeding 3360 but not exceeding 4200	496	489	486
Grade F	Exceeding 2400 but not exceeding 3360	415	408	405
Grade G	Exceeding 1300 but not exceeding 2400	315	308	305
4. Coal produced in the States of Assam, Arunachal Pradesh, Meghalaya and Nagaland				
Ungraded (Ash content not exceeding 25%)		Not exceeding Rs. 741		

Table III. Coking coal

Grade	Ash content	Sale price per tonne of		
		Steam coal and rubble	Slack coal	Run of mine coal
Steel Grade I	Not exceeding 15%	1058	1051	1048
Steel Grade II	Exceeding 15% but not exceeding 18%	885	878	875
Washery Grade I	Exceeding 18% but not exceeding 21%	768	761	758
Washery Grade II	Exceeding 21% but not exceeding 24%	638	631	628
Washery Grade III	Exceeding 24% but not exceeding 28%	493	486	483
Washery Grade IV	Exceeding 28% but not exceeding 35%	460	453	450

Table IV. Semi-coking and weakly coking coals

Grade	Ash plus Moisture content	Sale price per tonne of (Rs.)		
		Steam coal and rubble	Slack coal	Run of mine coal
Semi-coking Grade I	Not exceeding 19%	768	761	758
Semi-coking Grade II	Exceeding 19% but not exceeding 24%	638	631	628

Table V. Hard coke

No.	Type of coke	Ash content	Sale price per tonne (Rs.)
1	By-Product Hard Coke premium	Ash content not exceeding 25%	1893
2	By-Product Hard Coke ordinary	Ash content exceeding 25% but not exceeding 30%	1724
3	Beehive Hard Coke premium	Ash content not exceeding 27%	1439
4	Beehive Hard Coke superior	Ash content exceeding 27% but not exceeding 31%	1270
5	Beehive Hard Coke ordinary	Ash content exceeding 31% but not exceeding 36%	884

Table VI. Soft coke

No.	Type of coke	Sale price per tonne (Rs.)
1	Soft coke for industries	300
2	Soft coke for domestic consumption	175

Notes:

1. Long flame coals are coals which are declared as Long Flame coal by the coal producers and which satisfy the definition of long flame as per Note No. 6 under Table I of this notification.
2. Run of Mine coal is coal comprising of all sizes as it comes out of the mine, without any crushing or screening.
3. The fraction of the Run of Mine Coal as is retained on a screen when subjected to screening or is picked out by a fork-shovel during loading is called Steam Coal.
4. The fraction that remains after Steam Coal has been removed from the Run of Mine Coal is called Slack Coal.
5. If Run of Mine Coal is subjected to successive screening by two different screens of different apertures resulting in segregation into three different sizes, the fraction that is retained on the screen with the largest apertures shall be termed Steam Coal, the fraction passing through this screen but retained on the screen with the smaller

apertures, shall be termed Rubble Coal and the fraction passing through both the screens shall be termed Slack Coal.

6 (i) Where coal handling plants or mechanical screening and crushing facilities are available to limit top size of coal to any maximum limit within the range of 200 mm-250 mm, such coal will be priced at the average rate of prices of steam and slack coal in the ratio of 60:40 in case steam and slack fractions are not separated out.

(ii) Where the top size is being limited to any maximum limit within the range of 200 mm-250 mm, through manual facilities, an additional charge at the rate of Rs. 6/- per tonne will be levied on such coal.

7. Coking coal, weakly Coking Coal, Semi-Coking Coal which fall outside the categorization shown in Table I shall be treated as non-coking coal for the purposes of pricing and classified accordingly.

8. When the moisture content on 'as received' basis as defined under IS:1350:1959 of middlings at the washery end exceeds 10%, the price of middlings fixed in Table II shall be reduced by Re. 1/- for each one percent increase in the moisture content in excess of 10%, fraction pro-rata.

9. (i) When the 'Useful Heat Value' of non-coking coal exceeds 6400 Kilo calories per Kilogram, the price payable as per Table II for Grade A coal shall be increased at the rate of Re. 1/- for every 100 Kilo calories by which the actual 'Useful Heat Value' exceeds 6400 Kilo calories per kilogram, fraction pro-rata.

(ii) In case of coal produced in the States of Assam, Arunachal Pradesh, Meghalaya and Nagaland the price payable shall be increased at the rate of Rs. 11/- per tonne, for each percentage of ash by which the ash content falls below 22%. Similarly, when ash content exceeds 25% the price shall be reduced at the same rate of Rs. 11/- per tonne per percent of ash by which the ash content exceeds 25%.

10 (i) The prices notified herein are applicable only to sale of coal at pit-heads on FOR colliery siding basis or FOB purchaser's transport basis at the colliery loading point.

(ii) Where coal is transported beyond a distance of 3 km to the loading point, the coal companies shall be entitled to charge additional transport costs from the purchasers at following rates.

■ Distance more than 3 km but not more than 10 km	Rs. 18/- per tonne.
■ Distance more than 10 km but not more than 20 km	Rs. 35/- per tonne.

Ordinarily coal will not be transported beyond 20 km in respect of non-core sector consumers. In the case of core sector consumers, where coal is transported for more than 20 km to the loading points, transport charges will be payable on actual basis, to be borne by the purchasers. The core sectors for this purpose would include Steel, Loco, Cement, Power (Utility), Power (Captive) and Fertilizer.

11. The pit-head prices fixed in Tables II, III and IV are exclusive of royalty, cesses, taxes and levy, if any, levied by Government, local authorities or other bodies; duties of excise and sales tax.

    For removal of doubts it is hereby declared that colliery owners shall be entitled to add an amount equal to such royalty, cess, duties of excise, sales tax and other taxes, if any, to the pit-head prices fixed in the said Tables. In the case of washery middlings, the amount to be added shall be amount payable on raw coal of the same useful heat value range.

12. The pit-head prices of hard coke fixed in Table V and of soft coke fixed in Table VI are exclusive of duties of excise, royalty, cesses, and sales tax on either the raw coal used for manufacturing the coke or on the Hard coke or soft coke. The colliery owners shall be entitled to realize the amount of such duties of excise, royalty, cesses and sales tax and other taxes/levies, if any, from purchasers of Hard coke and soft coke in addition to the prices fixed for them. When the impost is on the raw coal used for manufacture of coke, the sum realizable per tonne of soft coke or hard coke shall be ascertained by multiplying the rates of raw coal by 1.35 for soft coke and 1.50 for hard coke.
13. Prices fixed shall not apply to coke or coal sold for export outside India.
14. For undertaking special sizing or beneficiation of coal, additional charges as may be negotiated between the purchaser and the producer may be realized over and above the fixed prices.
15. The prices fixed in Table V for Hard Coke and Table VI for soft coke shall not apply to small sized coke, coke breeze below 12 millimeters size, low temperature carbonization coke, pelletized coke or briquettes.
16. The prices fixed in Table V for by-product Hard Coke Premium and Beehive Hard Coke Premium shall be increased at the rate of Rs. 30/- per tonne for every one percent decrease in ash content below 23%, fraction pro-rata.
17. The prices fixed in Table V for By-product Hard Coke ordinary shall be reduced at the rate of Rs. 25/- per tonne for every one percent increase in ash content over 30%, fraction pro-rata.

18. The prices fixed in Table V for Beehive Hard Coke ordinary shall be reduced at the rate of Rs. 20/- per tonne for every one percent increase in ash content over 36%, fraction pro-rata.

19. When the ash plus moisture content of semi-coking Grade-I coals is less than 17%, the prices payable for Semi-coking Grade I coals as per Table IV shall be increased at the rate of Rs. 5/- per tonne for every one percent decrease in ash moisture content below 17%, fraction pro-rata.

20. A premium of 10% over and above the prices given in Table II of this notification will be charged by coal companies on coals of Grades A, B, C and D supplied from collieries listed in the Annexure to this notification.

(B N Makhija)
Additional Secretary to the Government of India
No.28012/7/93-CA

List of collieries

(See Note 20 below Table VI)

PANDAVESWAR AREA

Dalurband
Pandaveshwar
Kenda
Ramnagar 4 Pit
Kottadih
Samla
Purshottampur OCP

NUTANDANGA
A. Pansuli (Nutandanga 1 & 2 Pit)
B. Pure Samla (5 & 6 Pit)
C. Gogla (Darula)

JHANJRA AREA

Jhanjra Project
Nakrakonda

SONEPUR AREA

K K OCP
KENDA AREA
New Kenda
Krishnanagar
Bahula
Lower Kenda
Haripur
Haripur OCP
Chora

BANKOLA AREA

Manderboni
Bankola
Centenary Incl.
Shyamsundarpur

KUMARDIHI A

A. Kumardihi 3 & 4 Pit
B. North Incline (Jambad)
C. North Incline (Bonbahal)

KUMARDIHI B
A. 5 & 6 Pits
B. Goenka Kajora A&B Pits
C. C Pit
Tilaboni
Moira
Khandra
Shankarpur (Jambad)
Shankarpur 3 & 4 Pits
Shankarpur (Bonbahal)
Shankarpur OCP

KAJORA AREA
Naba Kajora
Madhabpur
Madhabpur 10 & 11 Pits
Dhandadih OCP
Lachipur
Ghanashyam
Khas Kajora

Chora OCP
Siduli
C L Jambad

KUNUSTORIA AREA

Amritnagar
Mahabir
N Searsole
Kunustoria
Bansra
Bansra OCP
Topsi
Parasea
Parasea OCP
Belbaid

SRIPUR AREA

Bhanora
Bhanora West
Block Mine
Girimint
Adjai II
Sripur
Jamuria (A & B Pit)
Ningah
S S Incl
Rana
Rana OCP

Ghanashyam OCP (Quarry No. 4)
Madhujore
Madhusudanpur
Parascole
Parascole OCP
Jambad
Jambad OCP

SATGRAM AREA

Tirat
Kuardih
Ratibati
Chapui Khas
J K Nagar
Jemehari
Nimcha
Nimcha OCP
Satgram (R)
Benalee
Mithapur
Pure Searsole
Satgram Incl
Kalidaspur Project

SODEPUR AREA

Ranipur
Parbelia (Sanctoria)
Parbelia (Dishergarh)
Dubeswari
Bhamuraia
Seetalpur
Sodepur
Moithdih
Poidih

GHUSICK
A. New Ghusick
B. Muslia
C. Kalipahari
Damra

SITARAMPUR AREA
Chinakuri 1 & 2 Pit
Chinakuri 3 Pit
Patmohana
Bejdih
Methani
Dhemomain
Narsamuda
Ramjibanpur
Barmondia
Chalkballarpur

CHIRIMIRI AREA

W Chirimiri UG/OC
W Chirimiri (Kanak Incl)
Dumanhill
Korea UG/OC
Korea Surguja Incl
New Chirimiri Ponri Hill
N.C.P.H. Project
Sonawani
Kurasia OC/UG
Chirimiri OC + Ug 1 & 3
Chirimiri OC + Ug 2 & 4
N Chirimiri (Kaparti)
N Chirimiri (Gorghala Bijora Top)

KASTA AREA
Madhaipur

BAIKUNTHPUR AREA

Kumda
Kumda New Incl 3 & 4
Bhatgaon
Bisrampur OCP
Bisrampur UG (Jainagar Incl)
Jainagar 5 & 6
Churcha
Katkona
Dugga OC

HASDEO AREA

N Jhagrakhand
S Jhagrakhand
W Jhagrakhand Jkd 'A' & 'B' Seams
Jhagrakhand (4 & 5)
Ramnagar
Malga Incl
Jhimar II (New 14 & 15)
Jhimar I (Old)
Jhimar III (11 & 12)
Rajnagar
New Rajnagar
Rajnagar 7 & 8
Rajnagar OC

Duman Seam Quarry
Ghorghella

JAMUNA & KOTMA AREA

Jamuna 1 & 2
Jamuna (3 & 4)
Jamuna (7 & 8)
Jamuna (9 & 10)
Jamuna OCP
Kotma (1 & 2)
Kotma (5 & 6)
Bhadra (5 & 6)
Bhadra (7 & 8)
Govinda

JOHILA AREA

Pinoura Mine No.-I

Bijuri
Beharhand Pilot Mine

SOHAGPUR AREA

Burhar No 1
OPM Incline
Burhar No 3
Dhanpuri OCP
Dhanpuri Incl
Amlai
Nowrozabad
Birsingpur
Umaria
New Chachai Incl.
Rungta 1 & 2
Rungta 3 & 4
Pali Project
Sharda OCP
Subhash Incl.
Vivek Nagar Incl.
Amlai OCP

CHAPTER 5

Investment environment and recent market developments in coal washing

Characteristics of Indian coal

The majority of non-coking coal reserves in India are in thick seams and inferior in quality. Most of the seams are banded in nature. The coaly matter in these seams is of high ash and the quality becomes worse because of these bands. The bands themselves are usually carbonaceous in nature and very rarely consist of pure sandstones. Almost always the dirt bands are as fragile as the coal. It is not possible to avoid contamination of the coal due to occurrence of bands within the coal seams and also due to contamination from roof and floor of the seam during mining. This extraneous material can be almost totally removed by washing but not without additional costs. The washing for elimination of extraneous dirt can reduce ash in coal by 6-7 points. The demand of coal for thermal power stations (TPS) which consume inferior grade coals is increasing at a fast rate. The potential coalfields for increased supplies of inferior grade coals linked to TPS in future are Korba, Talcher, Ib valley and North Karanpura. All these coalfields have thick banded seams of inferior coal. The characteristics of coals from these coalfields were studied and the results are summarized in Annexure 5.1.

Need for washing non-coking coal

In 1988, a Government Committee had recommended that coal to be supplied to new power stations located more than 1000 km away from the coalfields should be beneficiated to reduce the ash content to about 34%. Based on this recommendation, the Government had sanctioned two non-coking coal washeries with a total capacity of 14.5 Mt/a (Piprawar 6.5 mt/a and Kalinga 8.0 Mt/a). The Piprawar washery was linked to power stations in the north and Kalinga washery was linked to power stations in the south. Some factors in favour of washing non-coking coal are as follows.

- Better quality non-coking coal reserves are only about 12% of the total reserves; balance 73% being of poor quality, need to be beneficiated.
- Increased mechanized mining, particularly opencast mining, has led to further deterioration in the quality of run-of-mine (ROM) coal.
- Majority of the coal deposits are situated in the eastern and central parts of the country whereas the thermal power stations and other consumers are widely dispersed necessitating long distance transportation of coal.

- High cost of transportation of dirt along with coal and its subsequent disposal as ash adds to the cost and to the environmental problems arising from disposal of ash.
- Greater concern of consumers about quality consistency and the size of coal for improving their performance and productivity.

Recent developments in coal washing

The Coal Mines Nationalization Act has been amended in 1993 permitting captive mining by power sector and iron & steel sector. A copy of the Coal Mines Nationalization Amendment Act is enclosed vide Annexure 5.2. The Amendment Act also includes a provision through which Government of India can notify other industries which can be allowed to operate coal mines for captive use. Coal India has identified so far about 44 blocks which can be offered for captive mining for power sector. Details of the identified blocks are given in Annexure 5.3. The Amendment Act also permits setting of washery for coal washing by the private sector. A total capacity of 32.5 Mt/a for coal washing has been approved by the Government. The present status is given in Table 5.1.

Table 5.1. Status of non-coking coal washing

No	Washery	Capacity raw coal input (Mt/a)	Coalfield	Linked to	Status	Remarks
1	Bina	4.5	Singrauli	Obra TPS	Under construction	Humpolt Wedag India Ltd
2	Piprawar	6.5	North Karanpura	Dadri TPS Yamunanagar TPS	Under construction	White Industries Ltd
3	Kalinga	8.0	Talcher	North Madras TPS Tuticorin TPS	Work awarded	Robert and Shaffer
4	Bharatpur/ Ananta	5.0	Talcher	Vishakapatnam TPS	Work awarded	Madhu Continental
5	Dipka	6.0	Korba	Gandhi Nagar TPS Wanakbori TPS	Work awarded	Robert and Shaffer
6	Sasti	1.5	Wardha	Cement	Work awarded	Madhu Continental
7	Raigarh	1.0	Korba	Sponge iron	Offers being evaluated	

Demand for washed coal

Power sector (utilities)

The distance-wise coal demand for power stations in 1996-97 and 2001-02 has been estimated based on the projection prepared by the Ministry of Coal and is given in Table 5.2. The plant-wise details are given in Annexure 5.4.

Table 5.2. Distance-wise coal-demand for electricity sector (utilities) - Mt

Distance	1994-95		1996-97		2001-02	
Up to 200 km	91.1	(54)	103.8	(55)	139.3	(52)
200 - 500 km	12.3	(7)	12.8	(7)	23.0	(8)
500 - 1000 km	16.0	(10)	15.9	(9)	15.8	(6)
> 1000 km	48.4	(29)	55.0	(29)	90.5	(34)
Total	167.8	(100)	187.5	(100)	268.6	(100)

It can be seen from the table that the coal demand of distant power stations (> 500 km) is increasing from 64.4 Mt in 1994-95 to 106.3 Mt in 2001-02 i.e. an increase of 42 Mt. This increased demand will be fully loaded on the railway system for movement. Washing of coal would lead to a reduction in demand for the same level of power generation and this would reduce the stress on the railways.

The demand for washed coal for the power plants has been estimated for two scenarios namely:

Scenario 1 All power stations (existing and proposed) located beyond 500 km from the coal source.

Scenario 2 Only new power plants located beyond 500 km from the coal source.

The raw coal demand in 2001-02 as worked out by Ministry of Coal for power stations located beyond 500 km from the source is estimated at 106.3 Mt and 49.9 Mt for Scenario 1 and 2 respectively. The power plant-wise demand for coal for Scenarios I and II are given in Annexure 5.5. The coalfield-wise coal demand for TPS located beyond 500 km is given in Table 5.3.

Table 5.3. Coalfield-wise coal demand for TPS located beyond 500 km (existing + new)

Coalfield	1994-95	2001-02 (MOC estimates)	
		Scenario 1	Scenario 2
Raniganj	1.02	2.02	Nil
Mugma-Salanpur	1.87	Nil	Nil
Jharia	8.32	9.61	0.76
East Bokaro	3.13	1.48	Nil
South Karanpura	1.73	1.59	Nil
North Karanpura	9.94	16.69	5.59
Singrauli	Nil	7.74	7.74
Korba	2.1	1.77	0.76
Central India	8.17	3.67	Nil
Umrer	1.89	1.83	Nil
Wardha	2.68	5.98	4.0
Singareni	6.18	8.63	0.81
Ib valley	8.59	10.72	3.7
Talcher	8.87	34.59	26.53
Total	64.49	106.32	49.89

Note:

1. 1 Mt coal linkage shifted from Mugma to Raniganj for Tuticorin TPS in 2001-02.
2. For Wanakbori and Kota TPS coal linkage shifted from Korba to Singrauli in 2001-02.
3. The surplus coal after it is released from its earlier linkages gets absorbed by four new units of Khaperkheda, Paras extension, etc. The BSES (1-2) linkage shifts from Korba to IB Valley.

It can be seen from the table that the coalfields from where the coal demand is increasing significantly in 2001-02 are Talcher, North Karanpura, Singrauli, Ib valley and Wardha. In coalfields like Mugma-Salanpur, Central India and East Bokaro, the coal demand is declining. In the remaining coalfields, the demand is either stagnant or marginally increasing.

Selection of potential coalfields for setting up washeries

The following points have been considered while identifying the possible location of washeries for meeting the coal requirement of the power plants.

- Increased demand of coal for distant power plants.
- Inferior quality of coal being produced.
- Logistics of coal movement.

Based on these considerations, 5 coalfields have been identified for setting up of washeries. These are Talcher, North Karanpura, Singrauli, Ib valley and Wardha. The coal movement aspects have been discussed with the Railways and have their broad approval. The coal demand for existing and new power stations and only new power stations on these coalfields are given in Table 5.4.

Table 5.4. Coal demand for TPS in 2001-02 (Mt) - as per MOC

Coalfield	Existing + new (Scenario 1)	Only new (Scenario 2)
Wardha	6.0	4.0
Talcher	34.6	26.5
North Karanpura	16.7	5.6
Singrauli	7.7	7.7
Ib valley	10.7	3.7
Total	75.7	47.5

It can be stated that the potential capacity for washing ranges from 48 to 76 Mt in 2001-02. The Government is seriously considering the option that all new power stations likely to be installed in the future and located beyond 500 km from the source of supply should consume only washed coal. If this becomes a statutory requirement, then the washing capacity would be 48 Mt in 2001-02. This is in addition to about 33 Mt of washing capacity already approved by the Government for which the washeries are under various stages of implementation.

Coal demand projections made by CEA

As per CEA projections, the demand of coal in 2001-02 from North Karanpura and Talcher coalfields for new power stations located beyond 500 km would be 20.7 Mt and 24 Mt respectively as against Ministry of Coal's figures of 5.6 Mt for North Karanpura and 26.5 for Talcher. Therefore, there is likely to be an additional coal demand of 12.6 Mt in 2001-02.

New coal mines in the selected coalfields

An exercise has been carried out to identify the mines in the selected coalfields which can be linked to the proposed washeries. For some of these mines project reports have already been formulated and are awaiting approval. The details are given in Table 5.5.

Table 5.5. New coal mines likely to be linked to coal washeries

Coalfield	New mines proposed	Capacity (Mt/a)
Talcher	Hingula	8.0
	Bhubaneswari	10.0
	Kania	3.5
North Karanpura	Ashok Phase I	6.5
	Konar	3.5
	Kaveri	2.0
	Purnadih (East)	2.0
	K D Expansion	4.5
Ib valley	Basundhara	3.5
	Kulda	10.0
Singrauli	Bina Mine II	1.8
	Block B	3.0
	Nigahi Expansion	3.8
	Amlohri Expansion	5.5

Captive mines for new power stations

The government has permitted opening up new coal mines in the private sector which would be captive to new power stations. Out of 44 blocks identified for operation by private sector, 10 blocks have been allotted to different parties. The details are given in Table 5.6. A list of the captive coal blocks linked to power plants is given in Annexure 5.5.

Table 5.6. Captive coal mining blocks linked to power plants

Coalfield	Block name	Capacity (Mt/a)	Captive TPS	
			Name	Capacity (MW)
Rajmahal	Chuperbhita	NA	Sadadigi	NA
Birbhoom	Deocha-Pachmi	1.8	Balagarh	500
Raniganj	Saristhali	1.8	Budge-budge	500
North Karanpura	South Dadhu	2.0	Chandil	500
Wardha	Lohara West	NA	Bhadravati	NA
Wardha	Baranj	4.0	Bhadravati	1000
Talcher	Utkal A	2.0	Duburi	500
Talcher	Utkal B	2.0	Hospet	500
Ib valley	Talabira I	1.5	Hirakud	NA
Ib valley	Talabira II	2.0	Lapanga	500
Talcher		4.0	Vishakapatnam II	1000
Talcher		4.0	Krishnapatnam	1000
Total		25.1		6000

A tentative total capacity of 6000 MW and 25 Mt of coal capacity is being planned by these private power operators. All the power plants are within 500 km from the coal source except the three southern power plants linked to Talcher coalfield. The power plants located within 500 km may not opt for washed coal but the power plants in the southern region namely Hospet, Vishakapatnam II and Krishnapatnam, whose coal demand is 10 Mt are likely to accept washed coal.

Cement industry

Cement industry is a location - specific industry being dependent on availability of cement grade limestone which is mainly concentrated in the states of Andhra Pradesh, Karnataka, Madhya Pradesh, Rajasthan, Gujarat and Tamil Nadu. Therefore, the demand of coal by the cement industry also gets restricted to a few coalfields and the coal linkages are governed by the quality requirements and the rail transportation logistics. The cement plants require superior quality non-coking coals (grade B and C). However, in the past, there had been many complaints regarding the quality of coal supplies to the cement plants. The variation in quality of coal supplied to the cement plants from different sources at different times also seriously affects the operation of the cement plants. The problems are bound to increase because of limited potential of production of appropriate quality coal from Singareni and Central India Coalfields, the logical and traditional sources of supplies. This will compel the new cement plants to be linked to non-traditional coalfields mainly mining higher ash coal from open cast mines. The quality problem of supply from these coalfields can be tackled only by resorting to beneficiation of coal.

The coal demand for cement sector has been projected at 18.4 Mt in 2001-02. Assuming that 50% of the coal demand would be met from conventional sources, the balance would have to met from coalfields like Wardha, Korba, south Karanpura, Singrauli and Talcher in the form of washed coal from central washeries.

The basic idea of beneficiating coal for supply to cement plants is to ensure consistency in quality and size which are essential for smooth operation of the cement plants. The use of clean coal results in various operational and process improvements in the cement plant. These are

- Improvement in clinker quality.
- Utilization of marginal quality limestone.
- Increased thermal efficiency of kilns.
- Reduced coal consumption.
- Reduction in power consumption.
- Improvement in kiln output rate.
- Increase in cement production.
- Coal freight saving.

Recently a techno-economic study was carried out by CMPDI, TERI and other associates on the use of washed coal in cement plants. The study had recommended setting up one central washery each in the five coalfields namely; Korba, Wardha, South Karanpura, Singrauli and Talcher. The details are given in Table 5.7.

Table 5.7. Washed coal for cement plant cluster

Cement plant cluster	Washed coal requirement in 2001-02 (Mt/a)	Proposed washery		Linked coalfield
		Washery name	Capacity (Mt/a)	
Bilaspur	2.6	Dipka	4.5	Korba
Wardha	0.9	Sasti	1.6	Wardha
Northern region	1.7	Urimari	2.5	South Karanpura
Rajasthan	2.5	Bina	4.5	Singrauli
South India	1.4	Bhubaneswari	2.9	Talcher

The findings of the study are as follows.

- Increased demand of desired grade of coal (B, C) for the cement industry cannot be met from traditional sources of supply. About 50% of the demand of coal has to be met from coalfields which produce inferior grades of coal. To avoid adverse effects of poor quality coal on cement production, the coals would have to be washed in central washeries.
- There is a substantial reduction in coal freight by use of washed coal.
- In the techno-economic analysis, the washed coal price takes into consideration realization from the sale of middlings/rejects. These are utilized for generation of power adopting FBC technology at the washery end.
- There is a distinct benefit in the overall economics of the cement plants from the use of washed coal. However, the magnitude of benefit depends on the location of the plant, its capacity, nature of product mix, etc.

Sponge iron industry

Sixteen sponge iron plants have been set up in different parts of the country. A few more plants are also under construction. The total coal consumption is around 2.0 Mt/a, which is projected to increase to 3.6 Mt in 2001-02. These sponge-iron plants require superior grade non-coking coal (ash < 25%). They could be potential consumer of washed coal from the central washeries proposed for cement plants. One washery of capacity 1 Mt/a has already been identified in Korba coalfield for supply to a sponge iron plant. A list of sponge iron plants in operation and planned is enclosed vide Annexure 5.6.

Captive power plants

A number of industries representing primary producers of infrastructure materials such as iron and steel, aluminium, cement, paper, fertilizer, chemicals, etc. have their own captive power plants either to supplement the purchase of electricity from the utilities or for emergency use in case of power cut or for producing energy as a by-product of industrial process. Apart from industrial units, railways also have captive generation sets which are mainly used as a standby for emergency purposes. The total coal consumption by the captive power units of industries in 1993-94 was about 15.40 Mt which includes 2.0 Mt of washery middlings. According to Ministry of Coal projections, this would increase to 21.4 Mt in 2001-02 (including 2.7 Mt of middlings). The major operators are steel and aluminium plants. These plants could be potential consumers of washed coal. The list of major captive power units is enclosed vide Annexure 5.7.

Non-core sector consumers

This sector consists of a host of industries like paper, heavy chemicals, glass, ceramics, refractories, textiles, brick, jute, tea, etc. The consumption of coal in 1993-94 by these industries was 27.8 Mt (refer Table 3.1). In many of these industries the coal consumption is showing a declining trend. The coal demand in 2001-02 has been assessed as 27.6 Mt. The coal consumption by brick industry would increase in the future, but it is unorganized and widely dispersed. The industries like glass, ceramics, mini-cement, sponge iron require good quality coal and due to non-availability are shifting to other fuels. Even though there would be growth in these industries, coal demand is projected to decline and therefore we do not see any potential for supply of washed coal to these industries.

Summary of potential demand for washing coal

Based on the discussions in the previous paragraphs, the potential demand for washing coal in 2001-02 is as follows.

Sector	Scenario I	Scenario II
Power (utilities)	75.7	47.5
Private power stations	10.0	10.0
Cement	16.0	16.0
Sponge iron	3.6	3.6
Total	105.3	77.1
Additional coal for power utilities based on CEA demand projection	-	-

Therefore, it can be concluded that the demand for coal washing capacity ranges from 77.1 Mt to 106.3 Mt in 2001-02, of which the demand for washing capacity (for washed coal with ≤ 25 to 27% ash) would be 19.6 Mt. The balance is for power sector with washed coal having 32 ± 2% ash.

Price of washed coal

Washeries would need to be set up in the selected coalfields to wash the higher ash raw coal to produce washed coal of 30-34% ash for supply to linked power plants. In addition, washeries can also be set for supply of washed coal (25 to 27% ash) to cement and sponge iron plants. Washing increases the cost of coal supplies to the consumers. Washing of entire run-off-mine coal is a capital intensive process and fine coal beneficiation is particularly costly. Generally, only washing of coarse size coal + 13 mm size is recommended and mixed with untreated small size (-13 mm size) coal. The capital investment would be in the range of Rs. 150/- to Rs. 200/- million for a 1 Mt of washing capacity depending on the process (flow sheet) adopted for washing. The yield of washed coal would again depend on the process and also the requirement of the consumers. The process cost for a 3 Mt/a washery is assumed in the range of Rs. 100/- to Rs. 150/- per tonne of raw coal input. This is an approximation and we feel it is a reasonable estimate. The process cost includes salary and wages, stores, power, miscellaneous expenditure, aministrative charges, interest on working capital, depreciation, etc. The above elements of cost may be aggregated at the level of variable and fixed cost. The items covered under capital cost, process cost, etc. is given in Annexure 5.8. For power plants, it is generally assumed that the ash in washed coal would be between 30 to 34%. The lower the yield, higher will be the cost of washed coal assuming that the washery rejects are not used for any purpose. It is assumed that the selling price of washed coal would be cost plus 10% of cost. Based on these assumptions, the approximate price of washed coal at pit-head for different yields (80 and 70%) for a process of Rs. 100/- per tonne and Rs. 150/- per tonne are given in Table 5.8.

If rejects are used for power generation in fluidized bed boilers, credit would be given for the sale of rejects and the cost of washed coal would be correspondingly lower. The rejects produced from the coal washeries contain high ash (60-65%) and have very low calorific value (about 2000 kCal/kg). For using these rejects in boilers for power generation, fludised bed boiler technology has been developed and commercialized in India by M/s Bharat Heavy Electricals Limited. Based on this technology, several boilers are working in industrial units in India for steam/ power generation and a few units are also working in washeries for consuming washery rejects for power generation. Even for this technology the reject should have a calorific value of not less than 1800 kCal/kg. The price of reject would be based on negotiation between the washery and the power plant operators. All the rejects produced can be consumed in FBC boilers provided the cost of power generation is economical.

Table 5.8. Price of washed coal at pit-head (Rs./t)

	Process cost = Rs 150/t		Process cost = Rs.100/t	
	80% yield	70% yield	80% yeild	70% yeild
Raw coal cost ('F' grade 60% steam + 40% slack)	264	264	264	264
Royalty	50	50	50	50
Stowing duty	4	4	4	4
Sub-total	318	318	318	318
Sales tax @ 4%	13	13	13	13
Raw coal cost at pit-head	330	330	330	330
Process cost per tonne of input	150	150	100	100
Cost of washed coal per tonne of input	480	480	430	430
Cost of washed coal per tonne of output	601	686	538	615
Selling price of washed coal (cost of WC + 10%)	661	755	592	676

Rounded upto nearest decimal

Comparison of delivered price of raw coal and washed coal at a 500 MW TPS

An exercise has been done to assess the delivered price of raw coal (F grade) and washed coal at 80% yield and 70% yield at a 500 MW power station over distances ranging from 200 to 2000 km. It is assumed that the station heat rate is 2400 kCal/kg; handling and transit loss of coal is 5%, the power plant operates for 6000 hrs in a year and the power generated is 3000 million kWh, the raw coal quality is Ash - 42% and GCV - 3600 kCal/kg and washed coal quality is Ash - 32% and GCV - 4600 kCal/kg. The specific coal consumption would be 0.7 kg/kWh for raw coal and 0.55 kg/kWh for washed coal. Therefore, the coal consumption would be 2.1 Mt/a for raw coal and 1.65 Mt/a for washed coal. The coal is moved by rail to the power plant. The results are given in Table 5.9 a & b. Figures 5.1 a & b show the comparison of delivered price of raw coal and washed coal at varying distances.

Table 5.9 (a). Deliverd price of raw coal and washed coal (process cost at Rs.150/t)

Km	Rail freight (Rs/t)	Raw coal (Million Rs.)		Washed coal 80% (Million Rs.)		Washed coal 70% (Million Rs.)	
		Pit-head	Delivered cost	Pit-head	Delivered cost	Pit-head	Delivered cost
200	124	693.84	954.24	1085.62	1289.41	1240.71	1444.50
400	222	693.84	1160.04	1085.62	1450.47	1240.71	1605.56
600	335	693.84	1397.34	1085.62	1636.18	1240.71	1791.27
800	442	693.84	1622.04	1085.62	1812.04	1240.71	1967.12
1000	551	693.84	1850.94	1085.62	1991.17	1240.71	2146.26
1200	652	693.84	2063.04	1085.62	2157.17	1240.71	2312.25
1400	750	693.84	2268.84	1085.62	2318.23	1240.71	2473.31
1600	833	693.84	2243.14	1085.62	2454.64	1240.71	2609.72
1800	910	693.84	2604.84	1085.62	2581.18	1240.71	2736.27
2000	981	693.84	2753.94	1085.62	2697.87	1240.71	2852.96

Table 5.9 (b). Deliverd price of raw coal and washed coal (process cost at Rs.100/t)

Km	Rail freight (Rs/t)	Raw coal (Million Rs.)		Washed coal 80% (Million Rs.)		Washed coal 70% (Million Rs.)	
		Pit-head	Delivered cost	Pit-head	Delivered cost	Pit-head	Delivered cost
200	124	693.84	954.24	972.63	1176.42	1111.58	1315.37
400	222	693.84	1160.04	972.63	1337.48	1111.58	1476.43
600	335	693.84	1397.34	972.63	1523.19	1111.58	1662.14
800	442	693.84	1622.04	972.63	1699.05	1111.58	1837.99
1000	551	693.84	1850.94	972.63	1878.19	1111.58	2017.13
1200	652	693.84	2063.04	972.63	2044.18	1111.58	2183.12
1400	750	693.84	2268.84	972.63	2205.24	1111.58	2344.18
1600	833	693.84	2243.14	972.63	2341.65	1111.58	2480.59
1800	910	693.84	2604.84	972.63	2468.19	1111.58	2607.14
2000	981	693.84	2753.94	972.63	2584.88	1111.58	2723.83

Figure 5.1 (a). Delivered price of RC & WC at 500 MW TPS (process cost = Rs.150/t)

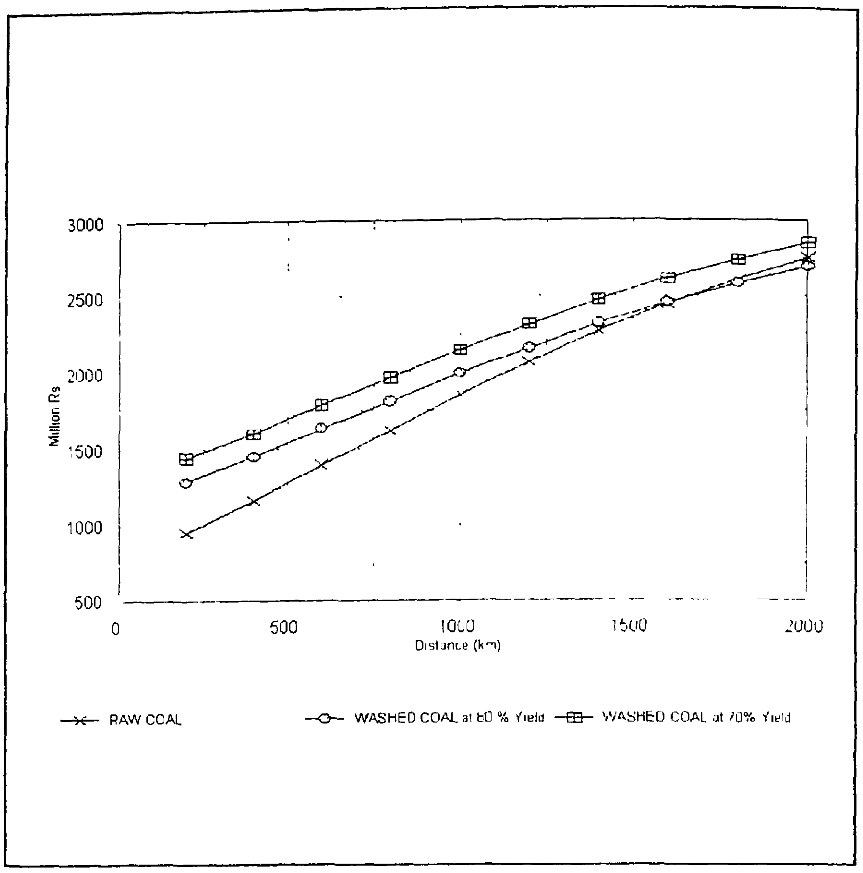
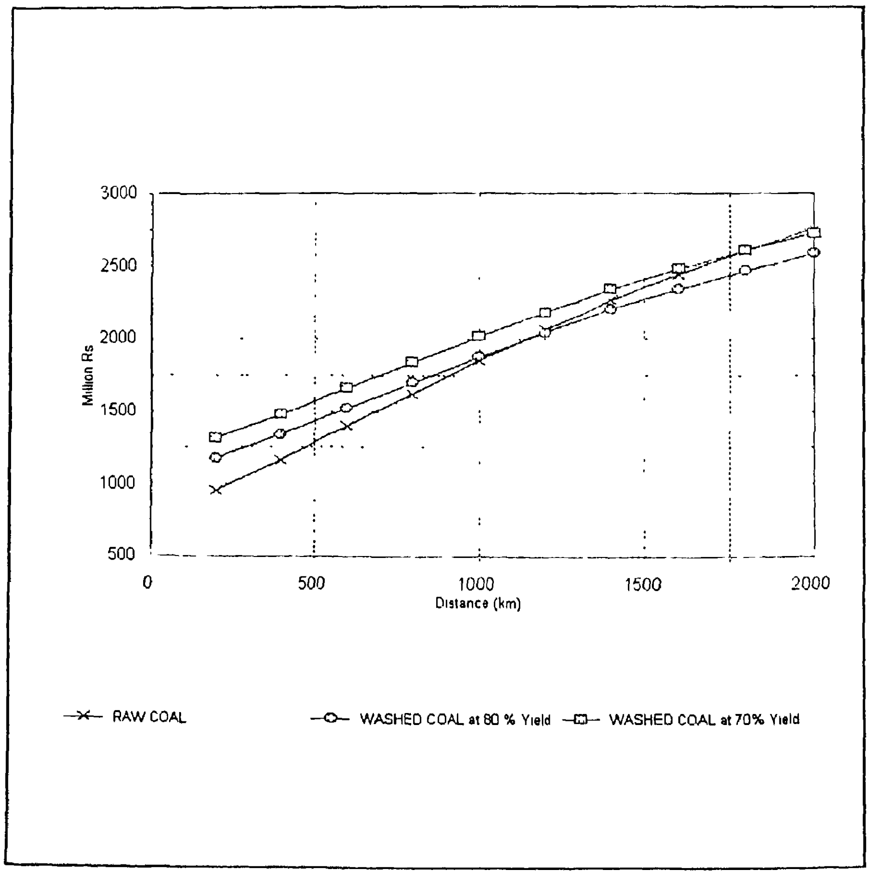


Figure 5.1 (b). Delivered price of RC & WC at 500 MW TPS (process cost = Rs.100/t)



The following points emerge from a study of the graph.

- For washed coal at 80% yield and estimated process cost of Rs. 100/- per tonne.
  - The cut-off point is at a distance of about 1100 km from the source and the savings are tablulated below.
- For washed coal at 70% yield and estimated process cost of Rs. 100/- per tonne.
  - The cut-off point shifts to 1800 km from the source and the savings on fuel charges is marginal at 2000 km.
- For washed coal with a estimated process cost of Rs. 150/- per tonne, the cut-off point shifts beyond 1700 km (with yield at 80%) and the savings in fuel charges is marginal. With yield at 70%, there is no savings upto 2000 km.

(Savings in million rupees)

Distance from source (km)	Process cost of Rs. 100/- and yield at		Process cost of Rs. 150/- and yield at	
	80%	70%	80%	70%
1600	101	-	-	-
2000	169	Marginal	56	-

- This is in addition to other benefits which may accrue to the TPS by way of increased generation, improvement in efficiency, etc.

Conclusions

- The Coal Mines Nationalization Act has been amended in 1993 permitting setting up of washery for coal washing by the private sector. Even though there are limitations that the coal washing company cannot sell washed coal directly to the consumers (under the Colliery Control Order), it is a step in the right direction. This has already attracted private sector companies and a washing capacity of about 33 Mt has been contracted till now for installation in different coalfields.
- The demand for coal washing capacity has been estimated for utilities and other potential consumers. It ranges from 77.1 Mt to 106.3 Mt in 2001-02, of which the demand for cement and sponge iron sector (with ash between < 25% to 27%) is estimated at 19.6 Mt. The balance is for power stations (utilities + private sector) with washed coal having 32 ± 2% ash.

- The potential coalfields for setting up the washeries are Talcher, North Karanpura, Ib valley, Singrauli and Wardha. New coal mines with an estimated capacity of about 67 Mt in these coalfield have also been identified, which can be linked to washeries.
- A comparison between the delivered price of raw coal and washed coal for a 500 MW TPS was done for distances ranging from 200 to 2000 km. The washed coal price was calculated based on 80% yield and 70% yield for process cost of Rs. 100/- and Rs. 150/- per tonne and zero value for the rejects. The results show that there are savings in fuel charges for TPS located beyond 1000 km in consuming washed coal provided the yield is 80% and process cost is pegged around Rs. 100/-.

Annexure 5.1. Data as revealed by Boreholes

NORTH KARANPURA COALFIELD			
LD Seam		**Block A**	**Block B**
1.	Total Seam Thickness (m)	14.29-20.92	15.75-18.30
2.	Band of thickness more than 1 m	Nil	Nil
3.	Percentage by weight of thin bands (ash plus moisture more than 55%) (55 to 65%)	10.6-13.5 (4.8-7.4)	19.9-25.7
4.	Total ash including bands - percent	29.9-39.9	36.6-36.7
5.	Ash excluding bands - percent	22.8-32.5	31.4-32.0
6.	Possible percentage points of ash reduction if bands are removed	4-7	5
TALCHER COALFIELD			
Seam II		**Block A**	**Block B**
1.	Total Thickness (m)	29.2-33.492	34.8-39.0
2.	Band of more than 1 m in thickness	Nil	Nil
3.	Percentage of (ash plus moisture more than 55%) (55 to 65%)	21.1-28.1 (8.9-16.7)	13.0-27.0 (6.3-12.5)
4.	Percentage of ash including bands	38.9-42.6	33.2-41.6
5.	Percentage of ash excluding bands	30.5-34.3	29.7-34.4
6.	Possible reduction in ash percentage if bands are removed	8	4-7
IB-VALLEY COALFIELD			
Lajkura Seam		**Block A**	**Block B**
1.	Total Seam Thickness (m)	18.8-19.4	26.2-27.6
2.	Band more than one metre thick (Total thickness in m)	One-two (2.2-3.8)	Three-four (4.4-5.3)
3.	Percentage by weight of thin bands (ash plus moisture more than 55%) (55 to 65%)	12.9-17.1 (7.0-15.0)	11.0-16.0 (9.3-11.3)
4.	Ash percentage including thin bands	37.5-41.8	39.6-42.0
5.	Ash percentage excluding bands	34.2-36.8	34.7-36.1
6	Possible reduction in ash percentage excluding bands	3-5	5-6

KORBA COALFIELD			
L K Seam		**Block A**	**Block B Top split**
1.	Total Seam Thickness (m)	62.1-71.7	36.1-40.3
2.	Bands one metre and above (thickness in m)	2-4 (2.9-8.6)	Nil-3 (Nil-4.1)
3.	Percentage by weight of thin bands (ash plus moisture more than 55%) (55 to 65%)	9.8-19.6 (6.6-8.1)	11.2-19.1 (0.7-4.5)
4.	Percentage ash including thin bands	29.9-34.5	34.8-43.1
5.	Percentage ash excluding bands	26.2-27.2	31.0-32.1
6.	Possible reduction in percentage ash	4-7	5-11

Annexure 5.2. Section 3 in Sub-section (3) in Clause (a) of the Amended Coal Mines (Nationalization) Act 1993

(3) On and from the commencement of Section 3 of the Coal Mines (Nationalization) Amendment Act, 1975:

(a) No person, other than -

- (i) the Central Government or a Government company or a corporation owned, managed or controlled by the Central Government, or
- (ii) a person to whom a sub-lease referred to in the proviso to clause (c) has been granted by any such Government company or corporation, or
- (iii) a company engaged in -
  - (1) the production of iron and steel,
  - (2) generation of power,
  - (3) washing of coal obtained from a mine, or
  - (4) such other end use as the Central Government may, by notification, specify.

shall carry on coal mining operation, in India, in any form.

Annexure 5.3. Mining blocks identified for being offered for captive mining by power sector

No.	Block	Subsidiary company	Coalfield	Grade	Remarks
1	Pirpainti-Barahat	ECL	Rajmahal	F	
2	Chuperbhita	ECL	Rajmahal	C-G	offered to M/s Development Consultants Ltd (Sagardigi TPS)
3	Dewanganj	ECL	Birbhoom	D-E	
4	Deocha-Pachmi	ECL	Birbhoom	C-E	offered to M/s RPG Enterprises (Balagarh TPS)
5	Barjora North	ECL	Barjora	E-G	
6	Barjora South	ECL	Barjora	E-G	
7	Sarisathali	ECL	Raniganj	D-G	allocated to M/s RPG Enterprises (Budge-Budge TPS)
8	Chakla	CCL	N.Karanpura	E-G	
9	North Dhadhu	CCL	N.Karanpura	E-F	
10	South Dhadhu	CCL	N.Karanpura	E-G	offered to M/s RPG Enterprises (Chandil TPS)
11	Pakri-Barwadih	CCL	N.Karanpura	NC-SC	
12	Rajbar	CCL	Auranga	F-G	
13	Tubed	CCL	Auranga	F-G	
14	Jagaldagga	CCL	Auranga	F-G	
15	Chiru	CCL	Auranga	F-G	
16	Jayanti	CCL	Jayanti	C-E	
17	Mahan	NCL	Singrauli	E-G	
18	Madanpur	SECL	Hasdo-Arand	B-G	
19	Bisrar	SECL	Hasdo-Arand	D-F	
20	Tara	SECL	Hasdo-Arand	D-F	
21	Patoria	SECL	Hasdo-Arand	F	
22	Mandla North	WCL	Pench-Kanhan	A-F	
23	Rawanwara North	WCL	Pench-Kanhan	A-F	
24	Sial Ghogri	WCL	Pench-Kanhan	A-F	
25	Brahmpuri	WCL	Pench-Kanhan	A-F	
26	Gotitoria East	WCL	Mohpani	B-D	
27	Gotitoria West	WCL	Mohpani	A-G	

No.	Block	Subsidiary company	Coalfield	Grade	Remarks
28	Lohara East	WCL	Wardha	B-E	offered to ACC, Wadi Captive TPS
29	Lohara West	WCL	Wardha	B-E	offered to M/s Nippon Denro Ispat Ltd (Bhadravati TPS)
30	Baranj I-IV	WCL	Wardha	D-E	-do-
31	Bander (excluding Morpar project)	WCL	Bandar	C-D	-do-
32	Gopalprasad West I	MCL	Talcher	F-G	
33	Gopalprasad West II	MCL	Talcher	F-G	offered to APSEB
34	Utkal-A	MCL	Talcher	F-G	offered to Kalinga Power Corporation (Duburi TPS)
35	Utkal-B	MCL	Talcher	F-G	offered to HOK International (Hospet TPS)
36	Utkal-C	MCL	Talcher	F-G	
37	Utkal-D	MCL	Talcher	F-G	
38	Utkal-E	MCL	Talcher	F-G	
39	Utkal-F	MCL	Talcher	F-G	
40	Chaturdhara	MCL	Ib valley	F-G	
41	Rampia	MCL	Ib valley	F-G	
42	Ghogarpalli	MCL	Ib valley	F-G	
43	Talabira-I	MCL	Ib valley	F-G	offered to Hirakud TPS (INDALCO)
44	Talabira-II	MCL	Ib valley	G	offered to Samlai Power Ltd (Lapanga TPS)

Annexure 5.4. Power plant-wise coal demand (As per MOC)

COY	CF	PH	U	MODE	94-95	95-96	96-97	2001-02
SCCL	SINGARENI	RAICHUR	4	RAIL	0.27	0.66	0.81	0.81
MCL	IB VALLEY	PARLI	6-7	RAIL				1.60
SCCL	SINGARENI	RAICHUR	1-3	RAIL	2.51	2.51	2.51	2.51
CCL	NORTH KARANPURA	RAJGHAT		RAIL		0.51	0.51	0.51
CCL	EAST BOKARO	RAJGHAT		RAIL	0.51			
SCCL	SINGARENI	PARLI	1-5	RAIL	2.55	2.55	2.55	2.55
CCL	NORTH KARANPURA	NCR		RAIL	2.79	3.04	3.04	3.04
SCCL	SINGARENI	MUDDANUR	1-2	RAIL	0.72	1.28	1.53	1.56
SCCL	SINGARENI	NELLORE		RAIL	0.13	0.13	0.13	
CCL	NORTH KARANPURA	PANIPAT	1-5	RAIL	2.25	2.25	2.25	2.25
BCCL	JHARIA	PANIPAT	6	RAIL			0.18	0.76
NCL	SINGRAULI	WANAKBORI	1-6	RAIL				4.58
SCCL	SINGARENI	VIJAYWADA	1-4	RAIL				1.20
SECL	KORBA	WANAKBORI	7	RAIL				0.76
MCL	IB VALLEY	WANAKBORI	1-6	RAIL	2.02	2.64	1.20	
SECL	KORBA	WANAKBORI	1-6	RAIL	1.54	1.94	2.66	
MCL	IB VALLEY	UKAI		RAIL	2.37	1.91	1.77	3.13
BCCL	JHARIA	ROPAR		RAIL	3.40	3.40	3.40	3.40
CCL	EAST BOKARO	ROPAR		RAIL	1.54	1.54	1.14	1.14
CCL	NORTH KARANPURA	ROPAR		RAIL			0.40	0.40
SECL	KORBA	TROMBAY		RAIL	0.29	0.29	0.29	0.29
CCL	NORTH KARANPURA	ROZA		RAIL				2.00
CCL	NORTH KARANPURA	GOINDWAL		RAIL				2.00
MCL	IB VALLEY	GANDHINAGAR	1-4	RAIL				0.89
BCCL	JHARIA	HARDUAGUNJ		RAIL	0.24	0.26	0.46	0.77
CCL	EAST BOKARO	HARDUAGANJ		RAIL				0.34
SECL	KORBA	GANDHINAGAR	5	RAIL				0.72
SECL	KORBA	BSES	1-2	RAIL	0.27	1.16	1.82	
MCL	IB VALLEY	BSES	1-2	RAIL				2.10
CCL	SOUTH KARANPURA	FARIDABAD		RAIL	0.72	0.72	0.72	0.72
ECL	RANIGUNJ	BONGAIGAON		RAIL	0.26	0.26	0.26	0.26
CCL	NORTH KARANPURA	BHATINDA	5-6	RAIL				1.59
BCCL	JHARIA	KOTA		RAIL	1.00	1.00	1.00	1.00
CCL	NORTH KARANPURA	BHATINDA	1-4	RAIL	2.19	2.19	2.19	2.19
CCL	NORTH KARANPURA	BADARPUR		RAIL	2.09	2.09	2.09	2.09
BCCL	JHARIA	BADARPUR		RAIL	1.77	1.77	1.77	1.77
CCL	SOUTH KARANPURA	INDRAPRASTHA		RAIL	0.87	0.87	0.87	0.87
BCCL	JHARIA	INDRAPRASTHA		RAIL	0.31	0.31	0.31	0.31
					32.61	35.28	35.86	50.11

ECL	MUGMA SALANPUR	TUTICORIN	1-3	RAIL CUM SEA	1 00	1 00	1 00	
MCL	IB VALLEY	VIJAYWADA	1-4	RAIL CUM SEA	1 20	1 20	1 20	
MCL	TALCHER	VIJAYWADA	1-4	RAIL CUM SEA	3 00	3 00	3 00	3 00
MCL	TALCHER	VISAKHAPATNAM	II	RAIL CUM SEA				4 00
MCL	TALCHER	VISAKHAPATNAM	1-2	RAIL CUM SEA				4 20
MCL	TALCHER	VIJAYWADA	5-6	RAIL CUM SEA	0 54	1 35	1 86	2 10
BCCL	JHARIA	TUTICORIN	1-3	RAIL CUM SEA	1 00	1 00	1 00	1 00
MCL	TALCHER	KRISHNAPATNAM	I	RAIL CUM SEA				4 00
MCL	TALCHER	KAYAMKULAM	1-2	RAIL CUM SEA				1 80
MCL	TALCHER	NORTH MADRAS	1-3	RAIL CUM SEA	0 27	1 47	2 28	2 43
MCL	IB VALLEY	METTUR		RAIL CUM SEA	2 00	2 00	3 50	2 00
MCL	TALCHER	METTUR		RAIL CUM SEA	2 07	2 07	0 57	2 07
MCL	TALCHER	MUDDANUR	3-4	RAIL CUM SEA				1 80
MCL	TALCHER	CUDDALORE	1-2	RAIL CUM SEA				4 20
ECL	RANIGUNJ	TUTICORIN	1-3	RAIL CUM SEA	0 76	0 76	0 76	1.76
MCL	TALCHER	TUTICORIN	4-5	RAIL CUM SEA	2 00	2 00	2 00	2 00
MCL	TALCHER	HOSPET		RAIL CUM SEA				2 00
MCL	TALCHER	ENNORE		RAIL CUM SEA	0 99	0 99	0 99	0 99
MCL	IB VALLEY	ENNORE		RAIL CUM SEA	1 00	1 00	1 00	1 00
					15 83	17 84	19 16	40 35
ECL	RAJMAHAL	MUZAFFERPUR EXTN		RAIL				1 80
WCL	UMRER	PARAS		RAIL	0 22	0 22	0 22	
CCL	GIRIDIH	MUZAFFERPUR		RAIL	0 15	0 20	0 20	0 20
SECL	KORBA	KORADIH		RAIL	5 10	5 10	5 10	5 10
ECL	MUGMA SALANPUR	MUZAFFERPUR		RAIL	0 37	0 32	0 32	0 32
CCL	NORTH KARANPURA	UNCHAHAR	1-2	RAIL				1 58
CCL	NORTH KARANPURA	UNCHAHAR	3-4	RAIL				1 88
CCL	NORTH KARANPURA	TANDA	4	RAIL		0 08	0 19	0 32
SECL	KORBA	PARAS EXTN		RAIL				1 00
CCL	NORTH KARANPURA	TANDA	1-3	RAIL	0 78	0 78	0 78	0 78
CCL	GIRIDIH	BARAUNI		RAIL	0 23	0 23	0 23	0 23
WCL	WARDHA VALLEY	BHUSAWAL		RAIL	2 00	2 00	2 00	2 00
ECL	MUGMA SALANPUR	BARAUNI		RAIL	0 30	0 30	0 30	0 30
BCCL	MUGMA SALANPUR	BALAGARH		RAIL				1 80
ECL	MUGMA SALANPUR	BANDEL		RAIL	0 65	0 65	0 65	0 43
MCL	IB VALLEY	KOLAGHAT		RAIL	0 80	1 12	1 12	2 12
BCCL	JHARIA	KOLAGHAT		RAIL	1 00	1 00	1 00	1 00
WCL	PENCH KANHAN	KHAPARKHEDA	1-2	RAIL	0 30	0 30	0 30	
SECL	CENTRAL INDIA	BHUSAWAL		RAIL	0 35	0 35	0 35	0 35
BCCL	MUGMA SALANPUR	BUDGE BUDGE		RAIL				1 80
					12 25	12 65	12 76	23 01

MCL	IB VALLEY	LAPANGA		RAIL				2.00
ECL	RANIGUNJ	MEJIA		RAIL	0.20	0.66	1.25	1.86
ECL	RANIGUNJ	KOLAGHAT		RAIL	2.00	2.00	2.00	1.00
SECL	KORBA	KHAPERKHEDA	3-4	RAIL				1.80
SECL	KORBA	KHAPERKHEDA	5-6	RAIL				2.10
CCL	EAST BOKARO	TENUGHAT	3-5	RAIL				1.86
ECL	RANIGUNJ	TITAGARH		RAIL	0.92	0.92	0.92	0.92
CCL	EAST BOKARO	TENUGHAT	1-2	RAIL	0.20	0.65	1.07	1.24
NCL	SINGRAULI	OBRA		RAIL	5.46	5.46	5.46	5.46
ECL	RANIGUNJ	SANTHALDIH		RAIL	0.52	0.16	0.02	
ECL	RANIGUNJ	DURGAPUR		RAIL	0.46	0.46	0.46	0.30
ECL	RANIGUNJ	CESC		RAIL	0.94	0.94	0.94	0.94
ECL	RANIGUNJ	CESC SOUTH		RAIL	0.56	0.56	0.56	0.56
ECL	RANIGUNJ	BUDGE BUDGE		RAIL			0.40	
ECL	RANIGUNJ	BAKRESHWAR		RAIL				2.30
ECL	RANIGUNJ	BANDEL		RAIL	0.61	0.61	0.61	0.83
MCL	TALCHER	DHUBRI		RAIL				2.00
ECL	RANIGUNJ	DPL		RAIL	0.72	0.72	0.72	0.72
CCL	NARTH KARANPURA	CHANDIL		RAIL				2.00
CCL	NORTH KARANPURA	PATRATU		RAIL/ROAD	1.62	1.62	1.62	1.62
WCL	WARDHA VALLEY	CHANDRAPUR	7	RAIL/ROAD/ ROPE				2.05
WCL	WARDHA VALLEY	CHANDRAPUR	1-6	RAIL/ROAD/ ROPE	7.10	7.10	7.10	7.10
					21.31	21.86	23.13	38.66
CCL	NORTH KARANPURA	PARICHA		RAIL	0.62	0.62	0.62	0.62
SECL	CENTRAL INDIA	SABARMATI		RAIL	1.42	1.42	1.42	1.42
BCCL	JHARIA	PANKI NEW		RAIL	0.60	0.60	0.60	0.60
CCL	SOUTH KARANPURA	PANKI OLD		RAIL	0.11	0.11	0.11	
CCL	EAST BOKARO	UNCHAHAR	1-2	RAIL	1.08	0.64	0.28	
SECL	CENTRAL INDIA	WANAKBORI	1-6	RAIL	1.02		0.72	
SECL	CENTRAL INDIA	SIKKA		RAIL	0.78	0.78	0.78	0.78
WCL	WARDHA VALLEY	UKAI		RAIL	0.76	1.22	1.36	
ECL	MUGMA SALANPUR	HARDUAGUNJ		RAIL	0.87	0.85	0.65	
NCL	SINGRAULI	KOTA		RAIL		0.66	1.87	3.16
WCL	WARDHA VALLEY	BHADRAWATI		RAIL				4.00
SECL	CENTRAL INDIA	GANDHINAGAR		RAIL	2.36	2.36	2.36	1.47
WCL	WARDHA VALLEY	NASIK		RAIL	1.92	2.00	2.00	1.98
CCL	SOUTH KARANPURA	OLD STNS UP		RAIL	0.03	0.03	0.03	
SECL	CENTRAL INDIA	KOTA		RAIL	2.59	2.21	1.29	
WCL	UMRER	NASIK		RAIL	1.89	1.81	1.81	1.83
					16.05	15.31	15.90	15.86
SECL	CENTRAL INDIA	BIRSINGPUR		RAIL/BELT	0.55	1.04	1.25	1.34
DVC	EB BERMO	BOKARO A		RAIL/ROAD	0.10	0.10	0.10	0.10
SECL	KORBA	KORBA WEST	5-6	RBELT				2.10

SECL	KORBA	KORBA WEST	1-4	RBELT	3.46	3.46	3.46	3.46
MCL	TALCHER	TALCHER OSEB EXTN		RBELT				1.80
MCL	TALCHER	TALCHER OSEB		RBELT	1.41	1.41	1.41	1.41
CCL	EAST BOKARO	CHANDRAPURA		ROAD	0.55	0.55	0.55	0.55
SCCL	SINGARENI	KOTHAGUDEM		ROAD	3.45	3.45	3.45	3.45
SECL	KORBA	SATPURA		ROAD	0.35	0.48	0.41	2.05
WCL	PATHERKERA	SATPURA		ROAD/BELT	2.27	1.92	1.91	1.89
WCL	PENCH KANHAN	SATPURA		ROAD/BELT	1.65	1.49	1.37	
WCL	KAMPTEE SILEWARA	SATPURA		ROAD/BELT	0.10	0.48	0.68	0.38
BCCL	JHARIA	CHANRAPURA		ROAD/ROPE/WW	0.87	0.87	0.87	0.87
SECL	CENTRAL INDIA	AMARKANTAK		ROAD/WW	1.00	1.00	1.00	1.00
CCL	EAST BOKARO	BOKARO B		ROAD/WW	1.50	1.83	1.83	1.83
SECL	KORBA	KORBA EAST		ROAD/WW	1.77	1.77	1.77	1.77
WCL	KAMPTEE SILEWARA	KHAPARKHEDA	1-2	ROPE	1.90	1.90	1.90	2.20
					20.93	21.75	21.96	26.20
SCCL	SINGARENI	RAMAGUNDAM B		MGR	0.27	0.27	0.27	0.27
SCCL	SINGARENI	RAMAGUNDAM STPS		MGR	9.55	9.55	9.55	9.55
WCL	PENCH KANHAN	PENCH		MGR				2.10
ECL	RAJMAHAL	KAHALGAON	2	MGR	0.25	0.47	0.81	0.85
SECL	KORBA	KORBA STPS		MGR	10.21	10.21	10.21	10.21
NCL	SINGRAULI	RIHAND	1-2	MGR	4.20	4.20	4.20	4.20
MCL	TALCHER	TALCHER STPS	1-2	MGR	0.40	2.15	3.77	4.10
NCL	SINGRAULI	VINDHYACHAL STPS		MGR	5.24	5.24	5.24	5.24
MCL	TALCHER	TALCHER STPS	3-4	MGR				4.10
NCL	SINGRAULI	RIHAND	3-4	MGR				4.20
NCL	SINGRAULI	SINGRAULI STPS		MGR	8.88	8.88	8.88	8.88
ECL	RAJMAHAL	FARAKKA STPS	5	MGR	0.30	1.40	2.00	2.00
ECL	RAJMAHAL	FARAKKA STPS	1-3	MGR	2.55	2.55	2.55	2.55
SECL	CENTRAL INDIA	BIRSINGPUR		MGR				1.34
NCL	SINGRAULI	ANPARA A		MGR	3.35	3.35	3.35	3.35
NCL	SINGRAULI	ANPARA B		MGR	1.50	2.74	3.27	3.48
ECL	RAJMAHAL	FARAKKA STPS	4	MGR	1.40	2.00	2.00	2.00
ECL	RAJMAHAL	KAHALGAON	1	MGR	0.25	0.47	0.81	0.85
ECL	RAJMAHAL	KAHALGAON	4	MGR			0.10	0.85
ECL	RAJMAHAL	KAHALGAON	3	MGR		0.16	0.40	0.85
MCL	IB VALLEY	IB	3-4	MGR				2.00
MCL	IB VALLEY	IB	1-2	MGR	0.47	1.07	1.32	1.44
					48.82	54.71	58.73	74.41
					167.80	179.40	187.50	268.60

Annexure 5.5(a). List of power plants (existing and new) located beyond 500 km (Scenario I)

COY	CF	PH	U	MODE	94-95	2001-02
SECL	CENTRAL INDIA	GANDHINAGAR		RAIL	2.36	1.47
SECL	CENTRAL INDIA	KOTA		RAIL	2.59	
SECL	CENTRAL INDIA	SABARMATI		RAIL	1.42	1.42
SECL	CENTRAL INDIA	SIKKA		RAIL	0.78	0.78
SECL	CENTRAL INDIA	WANAKBORI	1-6	RAIL	1.02	
					8.17	3.67
CCL	EAST BOKARO	HARDUAGANJ		RAIL		0.34
CCL	EAST BOKARO	RAJGHAT		RAIL	0.51	
CCL	EAST BOKARO	ROPAR		RAIL	1.54	1.14
CCL	EAST BOKARO	UNCHAHAR	1-2	RAIL	1.08	
					3.13	1.48
MCL	IB VALLEY	BSES	1-2	RAIL		2.10
MCL	IB VALLEY	ENNORE		RAIL CUM SEA	1.00	1.00
MCL	IB VALLEY	GANDHINAGAR	1-4	RAIL		0.89
MCL	IB VALLEY	METTUR		RAIL CUM SEA	2.00	2.00
MCL	IB VALLEY	PARLI	6-7	RAIL		1.60
MCL	IB VALLEY	UKAI		RAIL	2.37	3.13
MCL	IB VALLEY	VIJAYWADA	1-4	RAIL CUM SEA	1.20	
MCL	IB VALLEY	WANAKBORI	1-6	RAIL	2.02	
					8.59	10.72
BCCL	JHARIA	BADARPUR		RAIL	1.77	1.77
BCCL	JHARIA	HARDUAGUNJ		RAIL	0.24	0.77
BCCL	JHARIA	INDRAPRASTHA		RAIL	0.31	0.31

BCCL	JHARIA	KOTA		RAIL	1.00	1 00
BCCL	JHARIA	PANIPAT	6	RAIL		0.76
BCCL	JHARIA	PANKI NEW		RAIL	0 60	0 60
BCCL	JHARIA	ROPAR		RAIL	3.40	3.40
BCCL	JHARIA	TUTICORIN	1-3	RAIL CUM SEA	1 00	1.00
					8.32	9 61
SECL	KORBA	BSES	1-2	RAIL	0 27	
SECL	KORBA	GANDHINAGAR	5	RAIL		0 72
SECL	KORBA	TROMBAY		RAIL	0 29	0 29
SECL	KORBA	WANAKBORI	1-6	RAIL	1 54	
SECL	KORBA	WANAKBORI	7	RAIL		0 76
					2 10	1 77
ECL	MUGMA SALANPUR	HARDUAGUNJ		RAIL	0 87	
ECL	MUGMA SALANPUR	TUTICORIN	1-3	RAIL CUM SEA	1 00	
					1 87	0 00
CCL	NORTH KARANPURA	BADARPUR		RAIL	2 09	2 09
CCL	NORTH KARANPURA	BHATINDA	5-6	RAIL		1.59
CCL	NORTH KARANPURA	BHATINDA	1-4	RAIL	2 19	2 19
CCL	NORTH KARANPURA	GOINDWAL		RAIL		2 00
CCL	NORTH KARANPURA	NCR		RAIL	2 79	3 04
CCL	NORTH KARANPURA	PANIPAT	1-5	RAIL	2 25	2 25
CCL	NORTH KARANPURA	PARICHA		RAIL	0 62	0 62
CCL	NORTH KARANPURA	RAJGHAT		RAIL		0 51
CCL	NORTH KARANPURA	ROPAR		RAIL		0 40
CCL	NORTH KARANPURA	ROZA		RAIL		2 00
					9 94	16.69

ECL	RANIGUNJ	BONGAIGAON		RAIL	0 26	0 26
ECL	RANIGUNJ	TUTICORIN	1-3	RAIL CUM SEA	0 76	1 76
					1 02	2 02
SCCL	SINGARENI	MUDDANUR	1-2	RAIL	0 72	1 56
SCCL	SINGARENI	NELLORE		RAIL	0 13	
SCCL	SINGARENI	PARLI	1-5	RAIL	2 55	2 55
SCCL	SINGARENI	RAICHUR	4	RAIL	0 27	0 81
SCCL	SINGARENI	RAICHUR	1-3	RAIL	2 51	2 51
SCCL	SINGARENI	VIJAYWADA	1-4	RAIL		1 20
					6 18	8 63
NCL	SINGRAULI	KOTA		RAIL		3 16
NCL	SINGRAULI	WANAKBORI	1-6	RAIL		4 58
					0 00	7 74
CCL	SOUTH KARANPURA	FARIDABAD		RAIL	0 72	0 72
CCL	SOUTH KARANPURA	INDRAPRASTHA		RAIL	0 87	0 87
CCL	SOUTH KARANPURA	OLD STNS UP		RAIL	0 03	
CCL	SOUTH KARANPURA	PANKI OLD		RAIL	0 11	
					1 73	1 59
MCL	TALCHER	CUDDALORE	1-2	RAIL CUM SEA		4 20
MCL	TALCHER	ENNORE		RAIL CUM SEA	0 99	0 99
MCL	TALCHER	HOSPET		RAIL CUM SEA		2 00
MCL	TALCHER	KAYAMKULAM	1-2	RAIL CUM SEA		1 80
MCL	TALCHER	KRISHNAPATNAM	1	RAIL CUM SEA		4 00
MCL	TALCHER	METTUR		RAIL CUM SEA	2 07	2 07
MCL	TALCHER	MUDDANUR	3-4	RAIL CUM SEA		1 80
MCL	TALCHER	NORTH MADRAS	1-3	RAIL CUM SEA	0 27	2 43

MCL	TALCHER	TUTICORIN	4-5	RAIL CUM SEA	2 00	2 00
MCL	TALCHER	VIJAYWADA	1-4	RAIL CUM SEA	3.00	3 00
MCL	TALCHER	VIJAYWADA	5-6	RAIL CUM SEA	0.54	2 10
MCL	TALCHER	VISAKHAPATNAM	1-2	RAIL CUM SEA		4 20
MCL	TALCHER	VISAKHAPATNAM	II	RAIL CUM SEA		4.00
					8 87	34 59
WCL	UMRER	NASIK		RAIL	1.89	1 83
					1 89	1 83
WCL	WARDHA VALLEY	BHADRAWATI		RAIL		4 00
WCL	WARDHA VALLEY	NASIK		RAIL	1 92	1.98
WCL	WARDHA VALLEY	UKAI		RAIL	0 76	
					2 68	5 98
					64 49	106 32

Annexure 5.5(b). List of power plants (only new) located beyond 500 km (Scenario II)

COY	CF	PH	U	MODE	2001-02
MCL	IB VALLEY	BSES	1-2	RAIL	2.10
MCL	IB VALLEY	PARLI	6-7	RAIL	1.60
BCCL	JHARIA	PANIPAT	6	RAIL	0.76
SECL	KORBA	WANAKBORI	7	RAIL	0.76
CCL	NORTH KARANPURA	BHATINDA	5-6	RAIL	1.59
CCL	NORTH KARANPURA	GOINDWAL		RAIL	2.00
CCL	NORTH KARANPURA	ROZA		RAIL	2.00
SCCL	SINGARENI	RAICHUR	4	RAIL	0.81
NCL	SINGRAULI	KOTA		RAIL	3.16
NCL	SINGRAULI	WANAKBORI	1-6	RAIL	4.58
MCL	TALCHER	CUDDALORE	1-2	RAIL CUM SEA	4.20
MCL	TALCHER	HOSPET		RAIL CUM SEA	2.00
MCL	TALCHER	KAYAMKULAM	1-2	RAIL CUM SEA	1.80
MCL	TALCHER	KRISHNAPATNAM	I	RAIL CUM SEA	4.00
MCL	TALCHER	MUDDANUR	3-4	RAIL CUM SEA	1.80
MCL	TALCHER	NORTH MADRAS	1-3	RAIL CUM SEA	2.43
MCL	TALCHER	VIJAYWADA	5-6	RAIL CUM SEA	2.10
MCL	TALCHER	VISAKHAPATNAM	1-2	RAIL CUM SEA	4.20
MCL	TALCHER	VISAKHAPATNAM	II	RAIL CUM SEA	4.00
WCL	WARDHA VALLEY	BHADRAWATI		RAIL	4.00
					49.89

Annexure 5.6. List of sponge iron plants linked to selected coalfields

No.	Name of the plant	Linked coalfield	Coal requirement (Mt)	
			1994-95	2001-02
1	Goldstar Steel and Alloys Ltd	Talcher	0.30	0.30
2	Bellary Steel and Alloys Ltd	Talcher	0.10	0.18
3	Bihar Sponge Iron Ltd	North Karanpura	0.15	0.30
4	Sunflag Iron and Steel Ltd	Korba	0.40	0.60
5	Jindal Strips Ltd	Korba	0.36	0.66
	Total		1.31	2.04

Annexure 5.7. Captive power plants

No.	Name	Linked coalfield	Coal requirement (Mt/a)		Remarks
			1994-95	2001-02	
	Steel plants				
1	Durgapur	Raniganj	0.28	0.28	Existing unit
2	Burnpur	Raniganj	0.26	0.26	Existing unit
3	Rourkela	Raniganj/Ib	0.35	0.95	Existing unit
4	Bhilai	Korba and Ib	0.75	0.75	Existing unit
5	Vizag	Talcher	1.00	1.00	Existing unit
	Aluminium plants				
1	Renukoot	Singrauli	2.50	3.50	Expansion
2	BALCO	Korba	1.66	1.66	Expansion
3	NALCO (Damanjodi)	Ib	0.50	0.50	Existing unit
4	NALCO (Angul)	Talcher	4.00	6.50	Existing unit
5	INDALCO Hirakund	Ib	0.50	0.50	Expansion

Annexure 5.8. List of items included in the calculation of coal prearation cost

Capital investment

Land
Buildings
Know-how and Engineering
Plant & Equipment
Railway Siding
Furniture & Fittings
Vehicles
Environment related Cost
Development
    Plant Development
    Roads & Culverts
    Water Supply Scheme
    Pilot Scheme/Scientific Research etc.
    PR Preparation Cost

Margin Money
Capitalised Interest (IDC)
Revenue Expenditure Capitalised
Others

- Total Project Cost Estimate
    Equity Capital
    Loan Capital

Annexure 5.8. contd. Process cost

Raw Coal Input (MTPA)
Processed Coal Output (MTPA)
Yield of Processed Coal Output (%)
Middlings (%)

Raw Coal Cost
Salary And Wages
Stores
Power
Misc Expenditure
Admin Charges
Interest on Working Capital @ x%
Interest on Loan Capital @ y%
Depreciation
Less credit for Middlings
Cost of clean coal (1 - yield%) Output
Cost per Tonne of Output
Process Cost
    Per tonne of Input
    Per tonne of Output

Annexure 5.8. *contd.* Economics at different capacity levels

Raw coal input (MTY)

Washed coal at x% yield (MTY)

Process cost per tonne of input (Rs/t)
- Fixed cost
- Variable cost
- Total cost

Process cost per tonne of output (Rs/t)
- Fixed cost
- Variable cost
- Total cost

Total cost per tonne of input (Rs/t)
- Fixed cost
- Variable cost
- Total cost

Total cost per tonne of output (Rs/t)
- Fixed cost
- Variable cost
- Total cost

Specific investment per tonne of input (Rs/t)
- Equity capital
- Loan capital
- Total capita

Specific investment per tonne of output (Rs/t)
- Equity capital
- Loan capital
- Total capital

Price to yield x% return (IRR) on equity capital (Rs/t)

Glossary

Process cost: The cost of washing one tonne of coal excluding the cost of input coal and may include the salary and wages, stores, power, miscellaneous expenditure, administrative charges, interest on working capital (say at 19.5%), depreciation (say at 17%), etc. The above elements of cost may be aggregated at the level of variable and fixed cost.

Cess: is a tax or a levy imposed by the Government.

Duties: Payment to the public revenue especially the levied on the import, export, manufacture or sale of goods.

Core sector: Five main sectors of the industry namely Railways, Thermal Power, Steel, Cement and Fertilizer are grouped together and are known as "Core Sector".

Non-core sector: All indsutrial sectors except the industries under core sector are known as non-core sector. This group consists of host of industries like brick, textile, paper, chemicals, glass, ceramics, refractories, jute, tea, etc.

Inter-modal split: Coal is transported by various means. The share of different modes of transport in the total movement is termed as inter-modal split.

Coaly matter: Carbon content in coal.

References

- Annual Plan Document 1995-96, Ministry of Coal, Government of India
- Annual Report 1994-95, Ministry of Coal, Government of India
- Indian Railways Year Book, 1993-94
- Annual Sales and Marketing Report, 1993-94, Coal India Limited
- Study on Coal Transportation Infrastructure 1988, Ministry of Coal (RITES Report)
- Report on Economics of Using Beneficiated Non-Coking Coal, 1988, Planning Commission, Government of India (Ronghe Committee Report)
- Basic Port Statistics of India, 1993-94, Transport Research Wing, Ministry of Surface Transport, Government of India
- Report on Techno-Economic Study of Coal Washeries for Cement Industry, 1994
- Coal Demand and Linkages (1994-95 to 2001-02), 1994 (Mid-term appraisal of VIII Plan), CMPDIL
- Coal Directory, 1993-94, Coal Controller, Ministry of Coal, Government of India.
- Notification under Colliery Control Order, 1967, 1992, Government of India
- Caol Mines (Nationalisation) Amendment Act, 1993
- Gazette of India - price document, various years
- Agreement for supply of coal to SEBs
- Review of energy pricing structure in India, Meeta Mehra, et al, TERI. 1993
- Beneficiation of Indian Power Coals, S P Mathur, 1987
- Coal Industry in India - Development Issues, R K Sachdev, 1993
- Goods Tariff No.42, Part II, Indian Railways Conference Association. 1995
- Coal Information - International Energy Agency, France, 1995.